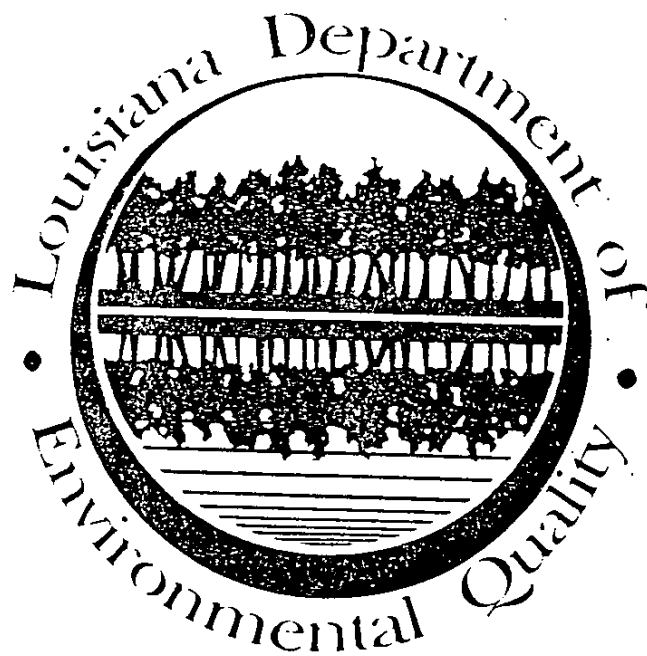


**DEVELOPMENT DOCUMENT**  
**for the**  
***INITIAL LIST OF 100 TOXIC AIR POLLUTANTS***

**PROPOSED TO BE REGULATED UNDER ACT 184**



**Prepared by**  
**LOUISIANA DEPARTMENT OF ENVIRONMENTAL QUALITY**  
**OFFICE OF AIR QUALITY AND NUCLEAR ENERGY**

**March 27, 1990**

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## **ABBREVIATIONS**

**(continued)**

HEA Doc. - EPA Health Assessment Document

HEEP - EPA Health and Environmental Effects Profile

mm Hg - Millimeters of mercury, a measure of barometric pressure

m<sup>3</sup> - Cubic Meter

n/a - Not applicable or Not available

Neuro. - Neurological toxicological effects

NTP - National Toxicology Program

NTP Classification Scheme:

CA- Chemical considered by NTP to be a known carcinogen.

CS- Chemical considered by NTP to be a suspected carcinogen.

OSHA - Occupational Health and Safety Administration

PEL - Permissible Exposure Level

ppb - Parts per billion

ppm - Parts per million

Repro. - Reproductive toxicological effects

STEL - Short-Term Exposure Level

TLV - Threshold Limit Value

TWA - Time Weighted Average

µg - Microgram, one millionth of a gram

signature by the governor, as provided in Article III, Section 18 of the Constitution of Louisiana.

Approved June 23, 1989.

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B. The secretary shall have the following powers and duties:

. . .

(6) To adopt and promulgate rules and regulations implementing a comprehensive toxic air pollutant emission control program in accordance with R.S. 30:2060.

. . .

§ 2060. Toxic air pollutant emission control program

A.(1) Not later than December 31, 1989, the secretary shall develop and publish a list of not more than one hundred toxic air pollutants pursuant to the criteria contained in R.S. 30:2053(3). Pollutants on this list shall be ranked or classified according to level of concern based on such criteria as emission levels, human health effects, population exposure, and persistence or accumulation in the environment.

(2) The secretary shall, from time to time, but not less than every three years review and revise the list established by Paragraph (1) of this Subsection, adding pollutants which present, or may present, a threat of adverse human health effects and deleting substances if the secretary has determined that the substances no longer meet the definition of "toxic air pollutant" as defined in R.S. 30:2053(3).

(3) Any person may petition the secretary to modify the list established by Paragraph (1) of this Subsection by adding or deleting a substance. Within six months after receipt of a petition, the secretary shall either grant the petition or publish a statement of the reasons for not granting the petition.

(4) A proposed list shall be published and public hearings held in accordance with the Administrative Procedure Act prior to final publication and promulgation.

B. Not later than July 1, 1990, the secretary shall propose initial rules and regulations identifying toxic air pollutants as defined in R.S. 30:2053(3), designating those toxic air pollutants which shall be subject to the provisions of this Section and establishing a schedule for the development of ambient air concentration standards, emission standards, and/or technical control standards for those toxic pollutants. These rules and regulations shall also have as an objective the prevention of sudden, accidental releases, and the minimization of consequences of any such releases. The secretary may grant credits to facilities undertaking voluntary reductions that exceed the regulatory requirements pursuant to R.S. 30:2054(B)(3) and rules and regulations to be promulgated thereunder.

C. It shall be a goal of the toxic air pollutant control program established by this Section and consequent promulgation of rules and regulations that the total amount of statewide emissions of toxic air pollutants be reduced by fifty percent from 1987 levels by December 31, 1994.

D. Facilities or sources which are found to be in noncompliance at the time of adoption and promulgation of the applicable rules and regulations developed pursuant to the provisions of this Section shall, within ninety days after the promulgation of such rules, submit a plan for achieving compliance. The secretary shall adopt compliance schedules for categories of facilities or sources. Compliance shall be required as expeditiously as practicable within a time frame determined necessary by the secretary.

E. In order to facilitate the identification and quantification of toxic air pollutants and the compilation and maintenance of the comprehensive air emissions inventory required in R.S. 30:2054(A)(1), the office of air quality and nuclear energy shall require facilities which emit or discharge toxic air pollutants, or substances under evaluation for such designation, to provide to the office the identity and quantities of such air contaminants emitted. Such information shall be made readily available to the public by the office of air quality and nuclear energy in an easily accessible form.

F. To further develop information concerning sources of and levels of exposure to toxic air pollutants, the office of air quality and nuclear energy shall conduct monitoring of toxic air pollutants at locations and times deemed necessary by the office. Information

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Human Services; Public Health Service; Center for Disease  
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No. 81-123

Table 26. Weighted Score Ranking Table for Class 3 Substances (Shane Weighting)

SUBSTANCE	WEIGHT	QUANTITY EMITTED	RELATIVE TOXICITY	POTENTIAL POPULATION EXPOSURE	ENVIRONMENT FATE/EFFECTS	WEIGHTED SCORE
	0.3	0.4	0.2	0.1		
	RANK					
CHLORINE	5	3	1	11		4.0
SULFURIC ACID	7	2	4	11		4.8
AMMONIA	1	12	2	7		6.2
HYDROCHLORIC ACID	8	8	3	11		7.3
HYDROGEN SULFIDE	2	10	9	9		7.3
PHOSPHORIC ACID	19	2	5	11		8.6
ETHYLENE GLYCOL	6	14	7	2		9.0
NITRIC ACID	13	5	14	11		9.8
MALEIC ANHYDRIDE	18	2	15	13		10.5
ACETONE	3	20	8	2		10.7
N-BUTYL ALCOHOL	10	16	6	3		10.9
MOLYBDENUM TRIOXIDE	23	4	16	1		11.8
METHYL ISOBUTYL KETONE	9	17	11	6		12.3
ACRYLIC ACID	21	6	12	12		12.3
PHTHALIC ANHYDRIDE	17	7	18	9		12.4
CUMENE	11	18	10	5		13.0
PHOSGENE	24	1	21	12		13.0
CRESOL	16	13	13	12		13.8
CARBONYL SULFIDE	4	20	20	8		14.0
HYDROGEN CYANIDE	20	9	17	10		14.0
VINYL ACETATE	12	15	19	11		14.5
PYRIDINE	22	11	22	11		16.5
ISOPROPYL ALCOHOL	14	19	23	4		16.8
PROPRIONALDEHYDE	15	20	24	10		18.3

Table 24. Weighted Score Ranking Table for Class 3 Substances (Equal Weighting)

SUBSTANCE	WEIGHT	QUANTITY EMITTED	RELATIVE TOXICITY	POTENTIAL POPULATION EXPOSURE	ENVIRONMENT FATE/EFFECTS	WEIGHTED SCORE
		0.25	0.25	0.25	0.25	
RANK						
CHLORINE		5	3	1	11	5.00
AMMONIA		1	12	2	7	5.50
SULFURIC ACID		7	2	4	11	6.00
ETHYLENE GLYCOL		6	14	7	2	7.25
HYDROCHLORIC ACID		8	8	3	11	7.50
HYDROGEN SULFIDE		2	10	9	9	7.50
ACETONE		3	20	8	2	8.25
N-BUTYL ALCOHOL		10	16	6	3	8.75
PHOSPHORIC ACID		19	2	5	11	9.25
METHYL ISOBUTYL KETONE		9	17	11	6	10.75
NITRIC ACID		13	5	14	11	10.75
CUMENE		11	18	10	5	11.00
MOLYBDENUM TRIOXIDE		23	4	16	1	11.00
MALEIC ANHYDRIDE		18	2	15	13	12.00
ACRYLIC ACID		21	6	12	12	12.75
PHthalic ANHYDRIDE		17	7	18	9	12.75
CARBONYL SULFIDE		4	20	20	8	13.00
CRESOL		16	13	13	12	13.50
HYDROGEN CYANIDE		20	9	17	10	14.00
VINYL ACETATE		12	15	19	11	14.25
PHOSGENE		24	1	21	12	14.50
ISOPROPYL ALCOHOL		14	19	23	4	15.00
PYRIDINE		22	11	22	11	16.50
PROPIONALDEHYDE		15	20	24	10	17.25



Table 22. Continued

SUBSTANCE	WEIGHT	QUANTITY EMITTED	RELATIVE TOXICITY	POTENTIAL POPULATION EXPOSURE	ENVIRONMENT FATE/EFFECTS	WEIGHTED SCORE
	0.3					
			0.4	0.2	0.1	
			RANK			
HYDROGEN FLUORIDE	18	56	11	26		32.6
1,1,1-TRICHLOROETHANE	6	69	15	4		32.8
ANILINE	44	28	32	21		32.9
HYDRAZINE	55	5	63	21		33.2
GLYCOLETHERS	20	58	18	12		34.0
HEXACHLOROETHANE	65	8	62	6		35.7
ZINC (AND COMPOUNDS)	22	70	6	1		35.9
ALLYL CHLORIDE	32	34	64	18		37.8
M,P-XYLENE	23	65	16	20		38.1
NITROBENZENE	46	38	37	20		38.4
ACROLEIN	42	42	34	22		38.4
HEXACHLOROETHANE	61	27	47	3		38.8
ETHYL ACRYLATE	39	30	69	20		39.5
COPPER (AND COMPOUNDS)	53	53	12	1		39.6
ANTIMONY (AND COMPOUNDS)	57	37	39	1		39.8
CHLOROETHANE	26	55	48	7		40.1
4,4-METHYLENEDIANILINE	68	12	66	18		40.2
DIAMINOTOLUENE	56	26	57	20		40.6
CHLORINE DIOXIDE	27	51	54	19		41.2
CHLOROPRENE	25	60	35	28		41.3
NAPHTHALENE	38	62	19	18		41.8
CHLOROETHENE	21	61	46	19		41.8
1,4-DICHLOROETHANE	62	25	61	14		42.2
METHYLMETHACRYLATE	28	64	33	18		42.4
BIPHENYL	40	54	40	20		43.6
SELENIUM (AND COMPOUNDS)	68	50	17	1		43.9
MERCURY (AND COMPOUNDS)	52	39	67	1		44.7
TOLUENE-2,4-DIISOCYANATE	63	35	58	27		47.2
TOLUENE-2,6-DIISOCYANATE	64	36	59	27		48.1
MANGANESE (AND COMPOUNDS)	49	57	53	1		48.2
DIBUTYL PHTHALATE	48	48	63	19		49.1
METHYL ACRYLATE	50	59	45	19		49.5
PENTACHLOROPHENOL	67	44	52	15		49.6
1,2,4-TRICHLOROETHANE	66	43	60	16		50.6
2,6-DINITROTOLUENE	45	68	56	26		54.5

Table 21. Continued

SUBSTANCE	QUANTITY EMITTED	RELATIVE TOXICITY	POTENTIAL POPULATION EXPOSURE	ENVIRONMENT FATE/EFFECTS	WEIGHTED SCORE
	0.2	0.4	0.3	0.1	
RANK					
HYDROGEN FLUORIDE	18	56	11	26	31.9
1,1,1-TRICHLOROETHANE	6	69	15	4	33.7
ANILINE	44	28	32	21	31.7
HYDRAZINE	55	5	63	21	34.0
GLYCOLETHERS	20	58	18	12	33.8
HEXACHLORO BENZENE	65	8	62	6	35.4
ZINC (AND COMPOUNDS)	22	70	6	1	34.3
ALLYL CHLORIDE	32	34	64	18	41.0
M.P.-XYLENE	23	65	16	20	37.4
NITROBENZENE	46	38	37	20	37.5
ACROLEIN	42	42	34	22	37.6
HEXACHLOROETHANE	61	27	47	3	37.4
ETHYL ACRYLATE	39	30	69	20	42.5
COPPER (AND COMPOUNDS)	53	53	12	1	35.5
ANTIMONY (AND COMPOUNDS)	57	37	39	1	38.0
CHLOROETHANE	26	55	48	7	42.3
4,4-METHYLENEDIANILINE	68	12	66	18	40.0
DIAMINOTOLUENE	56	26	57	20	40.7
CHLORINE DIOXIDE	27	51	54	19	43.9
CHLOROPRENE	25	60	35	28	42.3
NAPHTHALENE	38	62	19	18	39.9
CHLORO BENZENE	21	61	46	19	44.3
1,4-DICHLORO BENZENE	62	25	61	14	42.1
METHYLMETHACRYLATE	28	64	33	18	42.9
BIPHENYL	40	54	40	20	43.6
SELENIUM (AND COMPOUNDS)	68	50	17	1	38.8
MERCURY (AND COMPOUNDS)	52	39	67	1	46.2
TOLUENE-2,4-DIISOCYANATE	63	35	58	27	46.7
TOLUENE-2,6-DIISOCYANATE	64	36	59	27	47.6
MANGANESE (AND COMPOUNDS)	49	57	53	1	48.6
DIBUTYL PHTHALATE	48	48	68	19	51.1
METHYL ACRYLATE	50	59	45	19	49.0
PENTACHLOROPHENOL	67	44	52	15	48.1
1,2,4-TRICHLORO BENZENE	66	43	60	16	50.0
2,6-DINITROTOLUENE	45	68	56	26	55.6

Table 20. Continued

SUBSTANCE	WEIGHT	QUANTITY EMITTED	RELATIVE TOXICITY	POTENTIAL POPULATION EXPOSURE	ENVIRONMENT FATE/EFFECTS	WEIGHTED SCORE
	0.25	0.25	0.25	0.25	0.25	
				RANK		
ACRYLAMIDE		51	10	36	26	30.75
M,P-XYLENE		23	65	16	20	31.00
ANILINE		44	28	32	21	31.25
HEXACHLORO-1,3-BUTADIENE		54	13	49	9	31.25
2-NITROPROPANE		37	4	70	21	33.00
2,4-DINITROTOLUENE		36	16	55	26	33.25
ANTIMONY (AND COMPOUNDS)		57	37	39	1	33.50
CHLOROETHANE		26	55	48	7	34.00
SELENIUM (AND COMPOUNDS)		68	50	17	1	34.00
NAPHTHALENE		38	62	19	18	34.25
1,3-DICHLOROPROPYLENE		47	2	65	24	34.50
HEXACHLOROETHANE		61	27	47	3	34.50
ACROLEIN		42	42	34	22	35.00
HEXACHLOROBENZENE		65	8	62	6	35.25
NITROBENZENE		46	38	37	20	35.25
METHYLMETHACRYLATE		28	64	33	18	35.75
HYDRAZINE		55	5	63	21	36.00
CHLOROBENZENE		21	61	46	19	36.75
ALLYL CHLORIDE		32	34	64	18	37.00
CHLOROPRENE		25	60	35	28	37.00
CHLORINE DIOXIDE		27	51	54	19	37.75
BIPHENYL		40	54	40	20	38.50
ETHYL ACRYLATE		39	30	69	20	39.50
DIAMINOTOLUENE		56	26	57	20	39.75
MERCURY (AND COMPOUNDS)		52	39	67	1	39.75
MANGANESE (AND COMPOUNDS)		49	57	53	1	40.00
1,4-DICHLOROBENZENE		62	25	61	14	40.50
4,4-METHYLENEDIANILINE		68	12	66	18	41.00
METHYL ACRYLATE		50	59	45	19	43.25
PENTACHLOROPHENOL		67	44	52	15	44.50
DIBUTYL PHTHALATE		48	48	68	19	45.75
TOLUENE-2,4-DIISOCYANATE		63	35	58	27	45.75
1,2,4-TRICHLOROBENZENE		66	43	60	16	46.25
TOLUENE-2,6-DIISOCYANATE		64	36	59	27	46.50
2,6-DINITROTOLUENE		45	68	56	26	48.75

Table 19. Continued

SUBSTANCE	CAS NO.	QUANTITY EMITTED (pounds)	RANK	WT. OF EVID. CLASSIFICATION	RANK	RELATIVE TOXICITY	RANK	POPULATION EXPOSED	RANK	ENVIRON. PERSIST. half-life days	RANK
HEXACHLOROETHANE	67721	912	61	C3HSD8		4.00E-06	27	113,975	47	7900	3
HYDRAZINE	302012	1,200	55	2B, B2		2.90E-03	5	41,562	63	NO	21
HYDROGEN FLUORIDE	7664393	496,254	18	HSDB		TLV(C)-2.6	56	919,827	11	NO	26
M.P. XYLENE	1330207	305,586	23	HEEP/HSDB		TLV-A-434	65	609,154	16	1.8	20
MANGANESE (AND COMPOUNDS)	7439965	5,227+	49	ST, IEA		TLV-5	57	73,087	53	+++	1
MELAMINE	108781	121,000	31	HSDB		0.0000041	33	324,711	29	NO	15
MERCURY (AND COMPOUNDS)	7439976	2,300+	52	THEA		RAC-2	39	23,990	67	+++	1
METHANOL	67561	10,180,482	3	ET		TLV-262	63	1,619,225	4	31.2	13
METHYL ACRYLATE	96333	4,860	50	ET		TLV-35	59	1,39,909	45	NO	19
METHYLETHYL KETONE	78933	3,504,800	10	HEEP		RAC-20	41	1,561,004	5	0.6	23
METHYLMETHACRYLATE	80626	164,046	28	HEEP		TLV-A-410	64	258,851	33	NO	18
NAPHTHALENE	91203	64,049	38	HEEP		TLV-52	62	471,060	19	NO	18
NITROBENZENE	98953	15,050	46	HEEP		RAC-08	38	228,079	37	NO	20
O-XYLENE	95470	8,469,172	4	HEEP		TLV-A-434	66	709,731	14	1.9	19
PENTACHLOROPHENOL	87863	252	67	ICEX		RAC-30	44	74,588	52	21	15
PHENOL	108952	87,330	35	HEEP		RAC-30	45	1,179,739	7	NO	18
SELENIUM (AND COMPOUNDS)	7782492	EST. 100	68	ETP		TLV-0.2	50	609,154	17	+++	1
STYRENE	100425	674,636	16	2B		5.70E-07	31	440,554	21	0.5	24
TETRACHLOROETHANE	79345	32,271	41	C3HSD8		5.80E-05	19	301,436	30	53.3	10
TETRACHLOROETHYLENE	127104	6,050,049	7	1B, 2D		4.80E-07	29	802,755	13	47	12
TOLUENE	108883	52,754,767	1	ET, IAD		RAC-300	52	2,274,464	1	0.5	24
TOLUENE-2,4-DIISOCYANATE	584848	634	63	2B, IIE		TLV-A-005	35	57,833	58	0.1	27
TOLUENE-2,6-DIISOCYANATE	91087	534	64	ANIMAL CARE		OSHA PEL-002	36	57,833	59	0.1	27
TRACHLOROETHYLENE	79016	4,507,817	8	B2, 3		1.30E-06	20	198,288	42	14	17
VINYLDINE CHLORIDE	75354	135,000	30	C3H4D		5.00E-05	18	81,889	50	0.5	24
XYLENE (MIXED ISOMERS)	1330207	31,962,801	2	ENE/HEEP/HSDB		RAC-80	47	2,238,989	2	0.5	24
ZINC (AND COMPOUNDS)	7440668	377,320+	22	1FA		ND	70	1,293,221	6	+++	1

Meta and para xylene are collapsed and the cas # for xylene (mixed isomers) has been used.

Note:

- T - Teratogen
- ET - Experimental Teratogen
- PT - Potential Teratogen
- ST - Suspected Teratogen
- ERE - Experimental productive effects
- HRE - Human reproductive effects [6]
- ND - No Data

**Table 18. Weighted Score Ranking Table for Class 1 Substances (Shane Weighting)**

SUBSTANCE	WEIGHT	QUANTITY EMITTED	RELATIVE TOXICITY	POTENTIAL POPULATION EXPOSURE	ENVIRONMENT FATE/EFFECTS	WEIGHTED SCORE
		0.3	0.4	0.2	0.1	
RANK						
ASBESTOS (FRIABLE)		2	1	2	1	1.5
CHROMIUM VI (& COMPOUNDS)		8	2	3	2	4.0
ETHYLENE OXIDE		3	7	8	3	5.6
1,2-DIBROMOETHANE		10	8	4	4	7.4
BENZENE		1	16	1	6	7.5
ARSENIC (& COMPOUNDS)		13	6	6	1	7.6
CADMIUM (& COMPOUNDS)		16	4	7	1	7.9
NICKEL (& COMPOUNDS)		11	9	5	1	8.0
FORMALDEHYDE		6	11	9	10	9.0
VINYL CHLORIDE		4	12	12	9	9.3
ACRYLONITRILE		5	13	11	7	9.6
POLYCHLORINATED BIPHENYLS		18	3	13	5	9.7
PROPYLENE OXIDE		7	15	10	11	11.2
BERYLLIUM (& COMPOUNDS)		19	5	19	1	11.6
EPICHLOROHYDRIN		9	14	14	8	11.9
BIS(2-CHLOROETHYL) ETHER		14	10	15	11	12.3
ALUMINUM (FUMES/DUST)		15	16	16	1	14.2
STYRENE OXIDE		12	16	18	11	14.7
4-AMINOBIPHENYL		17	16	17	11	16.0

Table 16. Weighted Score Ranking Table for Class 1 Substances (Equal Weighting)

SUBSTANCE	WEIGHT	QUANTITY EMITTED	RELATIVE TOXICITY	POTENTIAL POPULATION EXPOSURE	ENVIRONMENT FATE/EFFECTS	WEIGHTED SCORE
	0.25	0.25	0.25	0.25	0.25	
RANK						
ASBESTOS (FRIABLE)	2	1	2	1		1.50
CHROMIUM VI (& COMPOUNDS)	8	2	3	2		3.75
ETHYLENE OXIDE	3	7	8	3		5.25
BENZENE	1	16	1	6		6.00
ARSENIC (& COMPOUNDS)	13	6	6	1		6.50
1,2-DIBROMOETHANE	10	8	4	4		6.50
NICKEL (& COMPOUNDS)	11	9	5	1		6.50
CADMIUM (& COMPOUNDS)	16	4	7	1		7.00
ACRYLONITRILE	5	13	11	7		9.00
FORMALDEHYDE	6	11	9	10		9.00
VINYL CHLORIDE	4	12	12	9		9.25
POLYCHLORINATED BIPHENYLS	18	3	13	5		9.75
PROPYLENE OXIDE	7	15	10	11		10.75
BERYLLIUM (& COMPOUNDS)	19	5	19	1		11.00
EPICHLOROHYDRIN	9	14	14	8		11.25
ALUMINUM (FUMES/DUST)	15	16	16	1		12.00
BIS(2-CHLOROETHYL) ETHER	14	10	15	11		12.50
STYRENE OXIDE	12	16	18	11		14.25
4-AMINOBIPHENYL	17	16	17	11		15.25

Table 14. EPA and IARC Classification Schemes for Carcinogens

**EPA CLASSIFICATION**

- A - Human carcinogen. Sufficient evidence from epidemiologic studies to support a causal association between exposure and cancer.
- B1 - Probable Human Carcinogen. Limited evidence of carcinogenicity in humans from epidemiological studies.
- B2 - Probable Human Carcinogen. Sufficient evidence of carcinogenicity in animals; inadequate evidence of carcinogenicity in humans.
- C - Possible Human Carcinogen. Limited evidence of carcinogenicity in humans.

**IARC CLASSIFICATION**

- 1 - Sufficient evidence to establish a causal relationship between the agent and human cancer; sufficient human evidence and/or no data, inadequate data or limited data of carcinogenicity in animals.
- 2A - Probable evidence of carcinogenicity to humans; at least limited evidence of carcinogenicity in humans
- 2B - Probable evidence of carcinogenicity to humans; Sufficient evidence in animals and inadequate data in humans.
- 3 - Chemical could not be classified as to its carcinogenicity in humans; chemicals were listed for carcinogenicity if there was limited evidence of carcinogenicity in animals.

Table 13. Continued

SUBSTANCE	CAS NO.	CANCER		DEVEL TOXIC	REPRO TOXIC	ACUTE TOXIC	CHRONIC TOXIC	NEURO TOXIC
		EPA	CALL IARC					
MELAMINE	108781				HSDB			
MERCURY (AND COMPOUNDS)	7439976			HEA	HEA	DWCD	DWCD	DWCD
METHANOL	67561							HSDB
METHYL ACRYLATE	96333					HEEP	HEEP	
METHYLETHYL KETONE	78933			HEEP	HEEP		HEEP	HEA
METHYL ISOBUTYL KETONE	108101						HSDB	HSDB
METHYL METHACRYLATE	80626			HEEP	HEEP		HEEP	
METHYL TERT-BUTYL ETHER	1634044							
METHYLENE BIS (PHENYLISOCYONATE)	101688							
4,4'-METHYLENEDIANILINE	101779		2B				HSDB	
MOLYBDENUM TRIOXIDE	1313275					RTECS	HSDB	HSDB
NAPHTHALENE	91203			HEEP			HEEP	
NICKEL (AND COMPOUNDS)	7440020	A	1	ATSDR	ATSDR	ATSDR	ATSDR	
NITRIC ACID	7697372					RTECHS		
4-NITROPHENOL	100027					RTECHS	HSDB	HSDB
NITROBENZENE	98953					RTECHS	HEEP	
2-NITROPROPANE	79469	B2	2B	HSDB	HEEP	HEEP	HEEP	
PENTACHLOROPHENOL	87865			HEA	HEEP	HEEP	HEA	
PERACETIC ACID	79210					RTECS	HSDB	
PHENOL	108952			HEEP		HEEP	HEEP	
p-PHENYLENEDIAMINE	106503					HEEP	HEEP	
PHOSGENE	75445					HAD		
PHOSPHORIC ACID	7664302							
PTHALIC ANHYDRIDE	85449						HEEP	HSDB
PROPIONALDEHYDE	123386						HSDB	
PROPYLENE	115071							
PROPYLENE OXIDE	75569		2A	HEEP	HEEP	HEEP	HEEP	HSDB
PYRIDINE	110861						HEEP	
QUINOLINE	91225					HEEP	HEEP	
SODIUM HYDROXIDE (SOLUTION)	1310732					HEEP	HEEP	
STYRENE	100425		2B	HEEP				
STYRENE OXIDE	96093		2A	HSDB	HSDB		HEEP	



Table 13. Continued

SUBSTANCE	CAS NO.	CANCER		DEVEL TOXIC	REPRO TOXIC	ACUTE TOXIC	CHRONIC TOXIC	NEURO TOXIC
		EPA	CALL IARC					
CARBON DISULFIDE	75150			HEEP	HEEP		HEEP	HEEP
CARBON TETRACHLORIDE	56235	B2	2B	HAD		HAD	HAD	HAD
CARBONYL SULFIDE	463581						HSDB	
CHLORINE	7782505					RTECS	HSDB	
CHLORINE DIOXIDE	10049044			HSDB	HSDB			
CHLOROACETIC ACID	79118					RTECS		
CHLOROBENZENE	108907				HAD		HAD	
CHLOROETHANE	75003	C						
CHLOROFORM	67663	B2	2B	ATSDR	ATSDR	RTECS	ATSDR	
CHLOROMETHANE	74873	C		HSDB	HSDB		HSDB	
CHLOROPRENE	126998			HEEP	HEEP	HEEP	HEEP	HSDB
CHROMIUM (AND COMPOUNDS)	7440473	A	1			ATSDR	ATSDR	
COBALT (AND COMPOUNDS)	7440484							
COPPER (AND COMPOUNDS)	7440508			HCA	HSBD		HSDB	
CRESOL (MIXED ISOMERS)	1319773					RTECS	HEEP	
M CRESOL	108394						HEEP	
O-CRESOL	95487					RTECS		HEEP
P-CRESOL	106445					RTECS	HEEP	HEEP
CUMENE	98828					RTECS		
CUMENE HYDROPEROXIDE	80159						HEED	HSBD
CYANIDE (AND COMPOUNDS)	57125					RTECS		
CYCLOHEXANE	110827			ATSDR		ATSDR	ATSDR	ATSDR
DIAMINOTOLUENE (MIXED ISOMERS)	25376458	B2	AP					
DIBENZOFURAN	132649						HSBD	
1,2-DIBROMOETHANE	106934	B2	2A	HEEP	HEEP	RTECS	HEEP	
DIBUTYL PHTHALATE	84742			HSBD	HSBD		HSBD	
DICHLOROBENZENE (MIXED ISOMERS)	25321226						HAD	
1,2-DICHLOROBENZENE	95501						HAD	
1,3-DICHLOROBENZENE	541731						HAD	
1,4-DICHLOROBENZENE	106467		2B					
1,2-DICHLOROETHANE	107062	B2	2B	HEEP	HEEP		ATSDR	
1,2-DICHLOROETHYLENE	540590						HEEP	

Table 12. Continued

SUBSTANCE	QUANTITIES EMITTED (LBS/1000)					COMMENTS
	SARA INDUSTRIES	MOBILE SOURCES	AREA SOURCES	OTHER SOURCES	TOTAL	
METHYL ISOBUTYL KETONE	329.8		132.8		462.6	
METHYLMETHACRYLATE	164.0				164.0	
MOLYBDENUM TRIOXIDE	.8				.8	
N-BUTYL ALCOHOL	233.9		92.4		326.3	
NICKEL (AND COMPOUNDS)	4.1				4.1	*Incinerators, fossil fuel combustion.
NITRIC ACID	182.8				182.8	*Fossil fuel combustion.
NITROBENZENE	15.1				15.1	
PHENOL	87.3				87.3	
PHOSGENE	.7				.7	
PHOSPHORIC ACID	16.5				16.5	
PHTHALIC ANHYDRIDE	23.7				23.7	
POLYNUCLEAR AROMATIC HYDROCARBONS						
PROPIONALDEHYDE	35.9				35.9	*Product of most combustion sources.
PROPYLENE	4,262.2	400.0			4,662.2	
PROPYLENE OXIDE	119.4				119.4	
PYRIDINE	1.4				1.4	
SELENIUM (AND COMPOUNDS)	.0				.0	
STYRENE	674.6				674.6	*Incineration, fossil fuel combustion
SULFURIC ACID	1,154.5				1,154.5	*Fossil fuel combustion.
1,1,2,2-TETRACHLOROETHANE	32.3				32.3	
1,1,2,2-TETRACHLOROETHYLENE	416.4		5,642.4		6,058.8	
TOLUENE	4,801.1	28,494.0	8,659.7	10,800*	52,754.8	*Glycol dehydrators;
TOLUENE DIISOCYANATE	1.2				1.2	
TRICHLOROETHYLENE	476.4		4,031.4		4,507.8	
VINYL ACETATE	217.0				217.0	
VINYL CHLORIDE	309.9				309.9	*Also emitted from landfills.
VINYLDIENE CHLORIDE	135.0				135.0	
XYLENE	2,094.9	26,448.0	2,088.2	10,080*	40,711.1	*Glycol dehydrators.
ZINC (AND COMPOUNDS)	377.3				377.3	*Incineration/fossil fuel combustion
TOTALS	131,887.0	89,676.0	31,919.6	36,000.0	289,482.7	
% OF TOTAL EMISSIONS	45.56	30.98	11.03	12.44	100.00	

Table 11. Estimate of SARA 313 Compound Emissions from Glycol Dehydrators in Louisiana

1. NATURAL GAS PRODUCTION .....	11,070	MMCFD*
2. TOTAL GAS PROCESSED BY GLYCOL DEHYDRATORS .....	7,749	MMCFD*
3. ESTIMATED AROMATIC (BTXE) EMISSIONS/MMCFD .....	2.33	Tons /Year
4. ESTIMATED TOTAL BTXE EMISSIONS .....	18,000	Tons/Year
5. TYPICAL SPECIATION OF BTXE EMISSIONS:		
BENZENE.....	37%	
TOLUENE.....	30%	
XYLENE.....	28%	
ETHYL BENZENE.....	5%	
6. ESTIMATED TOTAL BMXE EMISSIONS BY SPECIES:		
BENZENE.....	13,320,000	lbs/yr
TOLUENE.....	10,800,000	lbs/yr
XYLENE.....	10,080,000	lbs/yr
ETHYL BENZENE.....	1,800,000	lbs/yr

\* MMCFD - Million cubic feet per day.

NOTES: (Refer to items numbers above)

1. From July 10, 1989 Oil & Gas Journal.
2. Based on preliminary industry estimate that approximately 70% of natural gas produced is processed by glycol dehydrators.
3. Based on test results from 8 Exxon units.
4. Amount in item No. 2 times amount in item No. 3
5. Based on test results from 8 Exxon units.
6. Amount in item No. 4 times amount in item No. 5, converted to pounds.

Table 7. Emissions from Wastewater Treatment Plants

Seven Parish for 1987	
parish	population
Ascension	58,001
E. Baton Rouge	389,041
Iberville	33,447
Livingston	72,345
Pointe Coupee	24,475
St. James	21,986
W. Baton Rouge	20,592
total	619,887

total state population		4,460,578
emissions tons/yr	tons/person	state wide total
seven parish area		emissions t/yr
46.00	7.42E-05	331.01

compound	percentage	emissions t/yr
Benzene	1.15	3.81
Toluene	4.65	15.39
Ethylbenzene	0.78	2.58
p-Xylene/m-Xylene	0.00	0.00
o-Xylene	0.00	0.00
Chloroform	9.73	32.21
1,2-Dichloroethane	0.66	2.18
1,1,1-Trichloroethane	14.81	49.02
Carbon Tetrachloride	4.56	15.09
Trichloroethylene	1.14	3.77
Perchloroethylene	4.34	14.37
Chlorobenzene	0.00	0.00
Methylene Chloride	8.65	28.63
TOTAL	50.47	167.06

Table 4. SARA 313 Compound Emissions from Mobile Sources

Emissions from the transportation use of motor gasoline.

COMPOUND	EXHAUST WT%	EXHAUST	GASOLINE WT %	EVAPORATIVE LOSS	RUNNING LOSS
Total NMHC		110,256		40,130	36,037
Ethylene	7.37	8,126	0.00	0	0
Propylene	2.46	200	0.00	0	0
Benzene	3.85	4,245	2.06	827	734
Toluene	6.28	6,942	7.86	3,154	2,836
Ethylbenzene	1.00	1,103	1.49	598	538
p-Xylene/m-Xylene	3.51	3,870	5.91	2,372	2,132
o-Xylene	1.47	1,621	2.39	959	862
1,3-Butadiene	0.35	386	0.00	0	0
Total Toxics*		26,474		7,910	7,111

Emissions from the distribution and transport of motor gasoline.

COMPOUND	GASOLINE WT%	REFUEL	TRANSPORT	TRANSFER	TOTAL EMISSIONS†
Total NMHC		12,161	147	4,658	203,428
Ethylene	0.00	0	0	0	8,126
Propylene	0.00	0	0	0	200
Benzene	2.06	827	3	96	6,164
Toluene	7.86	956	12	366	14,247
Ethylbenzene	1.49	181	2	69	2,491
p-Xylene/m-Xylene	5.91	719	9	275	9,376
o-Xylene	2.39	291	4	111	3,848
1,3-Butadiene	0.00	0	0	0	386
Total Toxics*		2,397	29	918	44,838

\* In tons per year emitted.

† Total emissions from transportation use and distribution and transport of gasoline.

TABLE 3. Continued

CHEMICAL NAME	CAS REGISTRY NUMBER	TOTAL EMISSIONS (LBS)
1,2,-DIBROMOETHANE	106934	7,022
DIBUTYL PHTHALATE	84742	5,700
DICHLOROBENZENE (MIXED ISOMERS)	25321226	1,017
1,2,-DICHLOROBENZENE	95501	17,756
1,3,-DICHLOROBENZENE	541731	750
1,4,-DICHLOROBENZENE	106467	750
1,2,-DICHLOROETHANE	107062	2,324,486
1,2,-DICHLOROETHYLENE	540590	84,173
DICHLOROMETHANE	75092	357,459
1,2,-DICHLOROPROPANE	78875	266,900
1,3,-DICHLOROPROPYLENE	542756	6,270
DIETHANOLAMINE	111422	22,377
DIMETHYL PHTHALATE	131113	126,982
4,6-DINITRO-O-CRESOL	534521	3
2,4-DINITROTOLUENE	121142	69,948
2,6-DINITROTOLUENE	606202	17,862
1,4,-DIOXANE	123911	26,475
EPICHLOROHYDRIN	106898	34,237
2-ETHOXYETHANOL	110805	9,540
ETHYL ACRYLATE	140885	52,937
ETHYLBENZENE	100414	315,388
ETHYLENE	74851	6,900,943
ETHYLENE GLYCOL	107211	1,456,416
ETHYLENE OXIDE	75218	763,251
FORMALDEHYDE	50000	150,210
FREON 113	76131	528,938
GLYCOL ETHERS	111773	450,585
HEXACHLORETHANE	67721	912
HEXACHLORO-1,3,-BUTADIENE	87683	1,270
HEXACHLOROBENZENE	118741	367
HYDRAZINE	30212	1,208
HYDROCHLORIC ACID	7647010	1,048,525
HYDROGEN CYANIDE	74908	16,028
HYDROGEN FLUORIDE	7664393	496,254
HYDROQUINONE	123319	254
ISOPROPYL ALCOHOL (MANUFACTURING)	67630	124,958
4,4'-ISOPROPYLIDENEDIPHENOL	80057	250
LEAD	7439921	38,197
LEAD COMPOUNDS	20111	67,554
M-XYLENE	108383	150,721
MALEIC ANHYDRIDE	108316	20,825
MANGANESE	7439965	5,131
MANGANESE COMPOUNDS	7439965	96
MELAMINE	108781	121,000
MERCURY	7439976	2,300
METHANOL	67561	9,539,782
2-METHOXYETHANOL	109864	5,527
METHYL ACRYLATE	96333	4,860
METHYLENEBIS (PHENYLISOCYANATE)	101688	504
4,4'-METHYLENEDIANILINE	101779	112
METHYL ETHYL KETONE	78933	2,980,350

TABLE 2. Continued

CHEMICAL NAME	CAS REGISTRY NUMBER	TOTAL EMISSIONS (LBS)
NICKEL	7440020	3,350
ACRYLAMIDE	79061	2,943
MERCURY	7439976	2,300
4-NITOPHENOL	100027	2,250
QUINOLINE	91225	2,200
DIBENZOFURAN	132649	2,071
ANTHRACENE	120127	1,922
PYRIDINE	110861	1,384
HEXACHLORO-1,3.-BUTADIENE	87683	1,270
HYDRAZINE	30212	1,208
TERT-BUTYL ALCOHOL	75650	1,180
DIAMINOTOLUENE (MIXED ISOMERS)	25376458	1,161
COPPER	7440508	1,026
DICHLOROBENZENE (MIXED ISOMERS)	25321226	1,017
COPPER COMPOUNDS	20086	1,016
HEXACHLORETHANE	67721	912
ANTIMONY	7440360	751
NICKEL COMPOUNDS	20144	751
1,3.-DICHLOROBENZENE	541731	750
1,4.-DICHLOROBENZENE	106467	750
MOLYBDENUM TRIOXIDE	1313275	750
PHOSGENE	75445	698
TOLUENE-2,4.-DIISOCYANATE	584849	634
TOLUENE-2,6.-DIISOCYANATE	91087	534
STYRENE OXIDE	96093	523
METHYLENEBIS (PHENYLISOCYANATE)	101688	504
COBALT COMPOUNDS	20075	500
BIS(2-CHLOROETHYL) ETHER	542881	450
P-CRESOL	106445	445
HEXACHLOROBENZENE	118741	367
1,2,4.-TRICHLOROBENZENE	120821	256
HYDROQUINONE	123319	254
ARSENIC COMPOUNDS	20019	253
ANTIMONY COMPOUNDS	20008	251
4,4'-ISOPROPYLIDENEDIPHENOL	80057	250
ARSENIC	7440382	250
COBALT	7440484	250
PENTACHLOROPHENOL	87865	250
PERACETIC ACID	79210	188
O-CRESOL	95487	162
ALUMINUM (FUME OF DUST)	7429905	120
4,4'-METHYLENEDIANILINE	101779	112
ASBESTOS (FRIABLE)	1332214	110
TITANIUM TETRACHLORIDE	7550450	100
MANGANESE COMPOUNDS	7439965	96
CUMENE HYDROPEROXIDE	80159	60
CYANIDE COMPOUNDS	20097	5
4,6-DINITRO-O-CRESOL	534521	3
P-PHENYLENEDIAMINE	106503	3
CADMIUM COMPOUNDS	7440439	1
4-AMINOBIIPHENYL	92671	1

TABLE 2. Summary of TRIS 1987 Louisiana Industrial Emissions Data (Sorted by Quantity)

CHEMICAL NAME	CAS REGISTRY NUMBER	TOTAL EMISSIONS (LBS)
AMMONIA	7664417	71,896,365
METHANOL	67561	9,539,782
ETHYLENE	74851	6,900,943
TOLUENE	108883	4,801,067
CARBON DISULFIDE	75150	4,485,591
PROPYLENE	115071	4,262,185
ALUMINUM OXIDE	1344281	3,956,435
METHYL ETHYL KETONE	78933	2,980,350
1,2-DICHLOROETHANE	107062	2,324,486
CARBONYL SULFATE	463581	1,843,656
XYLENE (MIXED ISOMERS)	1330207	1,637,501
CHLORINE	7782505	1,532,624
ETHYLENE GLYCOL	107211	1,456,416
SULFURIC ACID	7664939	1,154,519
BENZENE	71432	1,136,498
HYDROCHLORIC ACID	7647010	1,048,525
CHLOROFORM	67663	916,038
ACETONE	57641	890,876
CHLOROMETHANE	74873	793,954
ETHYLENE OXIDE	75218	763,251
STYRENE	100425	674,636
CARBON TETRACHLORIDE	56235	549,143
1,1,1-TRICHLOROETHANE	71556	530,933
FREON 113	76131	528,938
HYDROGEN FLUORIDE	7664393	496,254
TRICHLOROETHYLENE	79016	476,417
ACETALDEHYDE	75071	458,237
1,3-BUTADIENE	106990	452,238
GLYCOL ETHERS	111773	450,585
CHLOROBENZENE	108907	424,928
TETRACHLOROETHYLENE	127184	416,449
ZINC (FUME OF DUST)	7440666	373,809
DICHLOROMETHANE	75092	357,459
1,2,4-TRIMETHYLBENZENE	95636	330,411
METHYL ISOBUTYL KETONE	108101	329,722
ETHYLBENZENE	100414	315,388
VINYL CHLORIDE	75014	309,865
SEC-BUTYL ALCOHOL	78922	307,260
1,2-DICHLOROPROPANE	78875	266,900
CUMENE	98828	264,470
N-BUTYL ALCOHOL	71363	233,943
ACRYLONITRILE	107131	232,000
CHLOROPRENE	126998	227,753
CHLOROETHANE	75003	219,706
VINYL ACETATE	108054	217,030
METHYL TERT-BUTYL ETHER	1634044	211,104
NITRIC ACID	7697372	182,803
O-XYLENE	95476	178,272
CHLORINE DIOXIDE	10049044	172,500
CYCLOHEXANE	110827	170,915
METHYL METHACRYLATE	80626	164,046



TABLE 1. PROPOSED LIST OF 100 TOXIC AIR POLLUTANTS TO BE REGULATED UNDER ACT 184

ACETALDEHYDE	ETHYLENE OXIDE
ACETONE	FORMALDEHYDE
ACETONITRILE	GLYCOL ETHERS [6]
ACROLEIN	HEXACHLORO-1,3-BUTADIENE
ACRYLAMIDE	HEXACHLOROBENZENE
ACRYLIC ACID	HEXACHLOROETHANE
ACRYLONITRILE	HYDRAZINE
ALLYL CHLORIDE	HYDROCHLORIC ACID
AMMONIA	HYDROGEN CYANIDE
ANILINE	HYDROGEN FLUORIDE
ANTIMONY (AND COMPOUNDS) [1]	HYDROGEN SULFIDE
ARSENIC (AND COMPOUNDS) [1]	MALEIC ANHYDRIDE
ASBESTOS	MANGANESE (AND COMPOUNDS) [1]
BARIUM (AND COMPOUNDS) [1]	MERCURY (AND COMPOUNDS) [1]
BENZENE	METHANOL
BERYLLIUM (AND COMPOUNDS) [1]	METHYL ACRYLATE
BIPHENYL	METHYL ETHYL KETONE
BIS(2-CHLOROETHYL) ETHER	METHYL ISOBUTYL KETONE
1,3-BUTADIENE	METHYL METHACRYLATE
CADMIUM (AND COMPOUNDS) [1]	MOLYBDENUM TRIOXIDE
CARBON DISULFIDE	N-BUTYL ALCOHOL
CARBON TETRACHLORIDE	NICKEL (AND COMPOUNDS) [1]
CARBONYL SULFIDE	NITRIC ACID
CHLORINATED DIBENZO-P-DIOXINS/FURANS [2]	NITROBENZENE
CHLORINE	2-NITROPROPANE
CHLORINE DIOXIDE	PHENOL
CHLOROBENZENE	PHOSGENE
CHLOROETHANE	PHOSPHORIC ACID
CHLOROFORM	PHTHALIC ANHYDRIDE
CHLOROMETHANE	POLYNUCLEAR AROMATIC HYDROCARBONS [7]
CHLOROPRENE	PROPIONALDEHYDE
CHROMIUM (AND COMPOUNDS) [1]	PROPYLENE OXIDE
COPPER (AND COMPOUNDS) [1]	PYRIDINE
CRESOL [3]	SELENIUM (AND COMPOUNDS) [1]
CUMENE	SILVER (AND COMPOUNDS) [1]
CYANIDE COMPOUNDS [4]	STYRENE
DIAMINOTOLUENE	SULFURIC ACID
1,2-DIBROMOETHANE	TETRACHLOROETHANE
DIBUTYL PHTHALATE	TETRACHLOROETHYLENE
1,4-DICHLOROBENZENE	THALLIUM (AND COMPOUNDS) [1]
1,2-DICHLOROETHANE	TOLUENE
DICHLOROMETHANE (METHYLENE CHLORIDE)	TOLUENE DIISOCYANATE [8]
1,2-DICHLOROPROPANE	1,1,1-TRICHLOROETHANE
1,3-DICHLOROPROPYLENE	1,1,2-TRICHLOROETHANE
DINITROTOLUENE [5]	TRICHLOROETHYLENE
1,4-DIOXANE	VINYL ACETATE
EPICHLOROHYDRIN	VINYL CHLORIDE
ETHYL ACRYLATE	VINYLDENE CHLORIDE
ETHYL BENZENE	XYLENE [9]
ETHYLENE GLYCOL	ZINC (AND COMPOUNDS) [1]

Those substances exhibiting effects relevant to more than one of the listed classes were placed in the class of highest concern according to Class 1 > Class 2 > Class 3. However, this process was intended to apply to classification only and not to imply, for example, that any particularly acute toxin in Class 3 would be of less concern than a particular suspected reproductive toxin in Class 2.

The listings of candidate substances according to this classification scheme can be found below in Section 2.4.

## **2.4 STEP 4 - RANK SUBSTANCES**

Substances within each of the three classes were ranked according to the four criteria: quantity emitted, relative toxicity, population exposed, and environmental persistence. Emission quantities represented total estimated emissions for the state. A plus (+) notation was employed in the ranking information tables to signify additional, unquantified emissions. And, professional judgement was employed to rank the substances according to the levels of estimated statewide emissions.

Ranking for relative toxicity employed a "weight of evidence" classification approach. Where available, EPA published risk factors were used for carcinogens, and TLVs (Threshold Limit Values) [16], EPA (RAC) Reference Air Concentrations [17], and PELs (Permissible Exposure Limits) [18] were used for acute toxins.

For the potentially exposed population criterion, the LSU CAD/GIS lab numbers for SARA industry emissions were augmented by notations of (+) where appropriate to reflect unquantified numbers of individuals exposed from other sources such as mobile, area, and "other" emission sources. As for emission quantities information, professional judgement was employed to rank the substances according to the statewide number of potentially exposed individuals.

For the environmental persistence criterion, there were numerous candidate substances for which there were no data on persistence or behavior

### **2.2.3 Potentially Exposed Populations**

For SARA industrial emissions, estimates of potentially exposed populations were accomplished by employing the geographic information system (GIS) computer services of LSU's CAD/GIS laboratory. The first step in this process involved generating 10 km circular zones around each industrial facility located on the map. These locations were found in the original TRIS emissions database. After the zones were produced using Intergraph GPPU zone software, they were overlain over the Louisiana zip code map to generate new polygons which reflected the areas of each zip code within the 10 km zones around each plant. After this overlay process, a ratio of the area of each zip code within the zone to the total area of the zip code was computed. This ratio was then multiplied by the total population of the zip code to determine the population affected by each plant for that zip code. This calculation was made for each zip code falling within the 10 km zone for each plant to determine the total population affected by that plant. This process was continued for each of the 219 plants in the database.

The process used for the chemicals was almost completely the same except that the zones for all plants producing the same chemical were combined to generate a total for the affected population for each chemical.

For mobile, area, and "other" emission sources, only a rough order-of-magnitude estimate could be made for the potentially exposed populations for each of the candidate substances.

### **2.2.4 Persistence in the Environment**

Environmental fate and effects information for candidate substances was obtained from published scientific literature [7 - 14]. There was generally good environmental persistence data for VOC's, based on atmospheric reactivities and half-lives [15]. However, professional judgement had to be employed for determining environmental behavior for those substances for which information was unavailable.

employed to provide estimates of total non-methane hydrocarbons (TNMHC) emitted from exhaust, running loss, evaporation, refueling, and fuel transport and transfer activities. Then, employing emissions profiles and gasoline composition data [1] and an approach used by Radian Corporation for a mobile toxics emission study for Houston [2], estimates of statewide emissions of the more prevalent mobile source toxics were made. The mobile emissions estimates data are summarized in Table 4.

It should be remembered that the emission estimates for toxic pollutants from mobile sources address only the more prevalent chemicals. There is a wide variety of toxic substances emitted in lesser, but still troublesome, quantities from motor vehicles and transportation fuels [3]. Additionally, there are many toxic substances formed secondarily in the atmosphere by photochemical processes acting on automobile emissions (for example, formaldehyde), and these are not accounted for here.

Estimates of emissions of toxic air pollutants from area sources were accomplished by employing emission estimating techniques used in developing VOC (volatile organic carbon) inventories for ozone nonattainment areas. Estimates of area emissions for the Baton Rouge area were made recently by Alliance Corporation [4] under contract to EPA as part of the overall emissions inventory requirement for developing a new State Implementation Plan for ozone. Figures contained along with published EPA emission factors [5] were used with recent population data to develop emission factors (lbs/person) for individual pollutants, and these numbers were then extrapolated to reflect emissions estimates for each substance for the total state population of about 4.5 million people.

Details and results for the emissions estimates for graphic arts, architectural coating, wastewater treatment, automobile refinishing, vapor degreasing, and dry cleaning are provided in Tables 5-10.

Unfortunately, we were unable to obtain estimates of emissions for some toxic air pollutants with known significance to urban air toxics such as chromium (from chemical treatment of comfort cooling towers and metal plating) and ethylene oxide (from sterilizers in labs and hospitals). Also, we had no reliable

## **2.0 PROCEDURES EMPLOYED IN LIST DEVELOPMENT**

A five-step evaluation process was employed to develop the initial list of 100 toxic air pollutants. Details on information and procedures employed in each step of the process are provided in the following subsections.

### **2.1 STEP 1 - DEVELOP LIST OF POTENTIAL CANDIDATES**

The SARA Title III (Emergency Planning and Community Right-to-know Act of the Superfund Amendments and Reauthorization Act of 1986) Section 313 list of over 300 substances served as the principal basis for determination of the universe of toxic substances that would be logical candidates for the "list of 100". This list was then reduced to account only for those substances known or reasonably expected to be emitted into the air in the State of Louisiana. Industrial, mobile (motor vehicles), and "area" sources (dry cleaners, print shops, paint shops, wastewater treatment, etc.) of pollutant emissions were considered. For reasons described previously, agricultural pesticides were not included for consideration at this time. Also not included in the evaluation were those substances of concern specific to workplace exposures and indoor air quality since these areas are not subject to regulation by the Department.

### **2.2 STEP 2 - DEVELOP INFORMATION FOR EACH CANDIDATE**

In accordance with Act 184, four basic criteria were employed for evaluation of substances for listing. These were: emission levels; human health effects; population exposure; and, persistence or accumulation in the environment. Thus, relevant information for these characteristics of each candidate substance was gathered and summarized for purposes of evaluating the substances for possible listing.

#### **2.2.1 Emission Levels**

Quantities of emissions for each candidate substance were obtained from reported data and by estimation. Industrial emissions data were obtained from the 1987 SARA Toxic Chemical Release Inventory System (TRIS) database. According to Section 313 of SARA Title III, companies releasing one

## **1.2 THE PROPOSED LIST**

Following careful evaluation and analysis of toxic air pollutants known to be emitted within the State, the Department has developed the proposed list of 100 substances provided in Table 1. A public hearing on the proposed list has been scheduled for April 6, 1990. Any revisions made to the list as a response to the public hearing will again be placed before the public for comment as part of the initial proposed rulemaking for the air toxics program scheduled for July, 1990.

Act 184 required that the initial proposed list contain no more than 100 toxic air pollutants. The final regulatory list, however, has no size restrictions and may contain more or less than 100 substances. As prescribed by Act 184, the list of regulated substances can be revised by either additions or deletions.

The list of candidate substances was narrowed from a maximum universe of about 150 toxic pollutants known to be emitted in the State. And, a number of those substances were emitted in quantities deemed too small for regulatory concern. However, it should be noted that the list does not at this time contain pesticides (which can be considered significant toxic air pollutants), since they are regulated by the Department of Agriculture and Forestry. It should also be noted that lead does not appear on the list although there are lead emissions within the state. It was not included on the list because it is a criteria pollutant regulated under other rules and regulations, and criteria pollutants were precluded from listing by Act 184. On the other hand, beryllium, for which there are no reported emissions in the state, appears on the list as a specific requirement of Act 184 to list all NESHAP (National Emission Standards for Hazardous Air Pollutants) substances.

As can be determined from the list and explanatory notes provided in Table 1, certain groups of substances such as metal compounds and xylene isomers have been listed as single entities. After review of approaches taken by other regulatory agencies (state and federal), the Department decided that listing in such a manner was the most prudent course for regulation of these substances.

## ACETALDEHYDE

Synonyms: Acetic aldehyde, Ethanal, Ethyl aldehyde, NCI-C56326

LA DEQ Regulatory Classification: Class 2

CAS Registry Number: 75070

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### PHYSICAL PROPERTIES:

Physical state:	Colorless, fuming liquid
Odor:	Pungent, fruity
Boiling point:	20.8° C
Vapor pressure:	750 mm Hg at 20° C
Half-life (clean air) (poll. air = 1/10)	1.7 days

### TOXICOLOGICAL PROPERTIES:

Acetaldehyde is on the Special Health Hazard Substance List because it is a mutagen, highly flammable and is reactive. It can be inhaled or absorbed through the skin. Eye contact with the liquid can cause severe irritation or burns with possible permanent damage. Skin contact with the liquid can cause a burning rash or allergy. Breathing the vapor can irritate the eyes, nose, throat and lungs, causing coughing and shortness of breath, or in severe cases, pulmonary edema. Chronic exposure can result in skin allergies, lung damage, birth defects, teratogenic effects, and possibly cancer.

IARC Classification... 2B

ACGIH TLV..... TWA 100 ppm; STEL 150 ppm

### PRINCIPAL SOURCES:

Acetaldehyde is primarily used as a chemical intermediate in the production of organic chemicals. It is used in perfumes, flavors, aniline dyes, plastics, synthetic rubbers, in silvering mirrors, and in the hardening of gelatin fibers. It is a product of alcohol fermentation and is found in automobile exhaust. It is a by-product of most hydrocarbon combustion processes.

### ENVIRONMENTAL FATE:

Acetaldehyde released into water or onto land will either volatilize or slowly biodegrade. In air, acetaldehyde reacts with photochemically generated hydroxyl radicals and ozone.

### SELECTED REFERENCES:

2, 5, 7

# ACETONE

Synonyms: Dimethylformaldehyde, Dimethyl ketone, Ketone propane, Propanone, Methyl ketone, Pyroacetic acid, Pyroacetic ether

LA DEQ Regulatory Classification: Class 3

CAS Registry Number: 67641

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## PHYSICAL PROPERTIES:

Physical state:	Colorless liquid
Odor:	Fragrant, alcoholic
Boiling point:	56.48° C at 760mm Hg
Vapor pressure:	266 mm Hg at 25° C
Half-life (clean air) (poll. air = 1/10)	122 days

## TOXICOLOGICAL PROPERTIES:

Acetone can affect you when ingested, inhaled or absorbed through the skin. Contact with the liquid can irritate the skin and severely damage the eyes. Human systemic effects by inhalation include changes in the EEG, changes in carbohydrate metabolism, conjunctiva irritation, respiratory system effects, nausea and vomiting, and muscle weakness. Ingestion causes kidney damage and coma. It also has narcotic effects when inhaled at high concentrations for a short time.

EPA HEA Profile... Chronic  
ACGIH TLV..... TWA 750 ppm; STEL 1000 ppm  
OSHA PEL..... TWA 1000 ppm

## PRINCIPAL SOURCES:

Acetone is widely used as a solvent and in the manufacture of other chemicals. It is used as a metal cleaning agent and as a dehydrating agent in research laboratories. It is also used in the manufacture of smokeless powder, paints, varnishes, lacquers, pharmaceuticals, sealants and adhesives. Acetone is found the 2-14 ppm range in gasoline exhaust.

## ENVIRONMENTAL FATE:

Due to its high vapor pressure, most acetone released enters the atmosphere where it is broken down relatively slowly, presumably through reaction with photochemically generated hydroxyl radicals. In water, up to 70% is removed through volatilization, with slow biodegradation affecting the remainder. A common air contaminant.



# ACETONITRILE

Synonyms: Cyanomethane, Ethanenitrile, Ethyl nitrile, Methyl cyanide, NCI-C60822

LA DEQ Regulatory Classification: Class 1

CAS Registry Number: 75058

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## PHYSICAL PROPERTIES:

Physical state:	Colorless liquid
Odor:	Aromatic
Boiling point:	81.1° C at 760mm Hg
Vapor pressure:	100 mm Hg at 25° C
Half-life (clean air) (poll. air = 1/10)	1350 days

## TOXICOLOGICAL PROPERTIES:

Usual exposure is from inhalation or absorption through the skin. Acetonitrile can irritate the eyes, nose, throat, and lungs. Exposure can cause fatal cyanide poisoning. Symptoms include flushing of the face, chest tightness, nausea and vomiting, weakness, shortness of breath, and eventually death. These reactions may begin hours after overexposure. Chronic, sublethal effects include damage to the nervous system, liver, and kidneys. Repeated exposure may effect the thyroid gland, causing enlargement.

EPA HEEP Listing... Devel., Acute, Chronic  
ACGIH TLV..... TWA 40 ppm; STEL 60 ppm (skin)  
OSHA PEL..... TWA 40 ppm

## PRINCIPAL SOURCES:

Acetonitrile is used as a solvent, and in the manufacture of pesticides and pharmaceuticals.

## ENVIRONMENTAL FATE:

Acetonitrile released into the air will not react readily, and will therefore build up in the atmosphere and is subject to transport far away from generation source. In water, acetonitrile is subject to biodegradation by acclimated or mutant microbes.

## SELECTED REFERENCES:

2, 5

# ACROLEIN

Synonyms: Acraldehyde, Acrylic aldehyde, Aqualine, Biocide, Ethylene aldehyde, 2-Propenol, Propylene aldehyde, Slimicide

LA DEQ Regulatory Classification: Class 2

CAS Registry Number: 107028

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## PHYSICAL PROPERTIES:

Physical state:	Colorless or yellowish liquid
Odor:	Piercing, disagreeable
Boiling point:	52.5° C at 760mm Hg
Vapor pressure:	265 mm Hg at 25° C
Half-life (clean air) (poll. air = 1/10)	1.4 days

## TOXICOLOGICAL PROPERTIES:

Acrolein is a very potent, reactive substance. Mode of exposure is through contact with liquid or inhalation of vapors. Contact with the liquid can severely burn the skin and eyes. Breathing the vapor may irritate the lungs, causing coughing and/or shortness of breath. Higher exposures can cause a buildup of fluid in the lungs, causing death. Other symptoms of inhalation exposure include dizziness, nausea, headaches, and in higher concentrations, unconsciousness and death. Chronic health effects include skin allergy, rash, drying and crackling of the skin, and permanent lung damage. Acrolein is a mutagen and possible carcinogen.

ACGIH TLV....TWA 0.1 ppm; STEL 0.3 ppm  
OSHA PEL.... TWA 0.1 ppm

## PRINCIPAL SOURCES:

Acrolein is released to the environment in emissions and effluents from manufacturing and use facilities. It is used as a chemical intermediate for glycerine, methionine, glutaraldehyde and other organic chemicals. It is also found in exhaust gas from combustion processes, and formed as a photooxidation product of various hydrocarbon pollutants, including 1,3-butadiene. Acrolein is used directly as an aquatic herbicide and slimicide through application to water and wastewater.

## ENVIRONMENTAL FATE:

If released onto soil or into water, volatilization and biodegradation are important fate processes. In water acrolein will persist from 6 to 12 days before being lost to these processes. In the atmosphere, acrolein is expected to exist almost entirely in the vapor phase. The dominant removal mechanism is expected to be reaction with photochemically generated hydroxyl radicals.

**SELECTED REFERENCES:**

2, 3, 5

## ACRYLIC ACID

Synonyms: Acroleic acid, Ethylenecarboxylic acid, Propene acid,  
2-Propenoic acid, Vinylformic acid

Regulatory Classification: Class 3

CAS Registry Number: 79107

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### PHYSICAL PROPERTIES:

Physical state:	Clear liquid
Odor:	Sharp, sweet
Boiling point:	141° C
Vapor pressure:	3.2 mm Hg at 20° C
Half-life (clean air) (poll. air = 1/10)	n/a

### TOXICOLOGICAL PROPERTIES:

Most probable route of human exposure is through inhalation or absorption through the skin. Contact with the liquid can cause severe burns to the skin and eyes, resulting in permanent damage. Vapors will irritate the eyes, nose, and throat. Long-term exposure may damage the kidneys and lungs. There is limited evidence that acrylic acid is a teratogen in animals. Until further testing has been done, it should be treated as a possible teratogen in humans.

NTP Classification..... CS  
IARC Classification... 2A  
EPA Classification..... B1  
ACGIH TLV..... TWA 10 ppm (2 ppm proposed)

### PRINCIPAL SOURCES:

Acrylic acid is used in the manufacture of plastic products, leather finishings, and paper coatings. In chemical manufacture, acrylic acid is a monomer for polyacrylic and polymethacrylic acids and other acrylic polymers.

### ENVIRONMENTAL FATE:

Based on its relatively low vapor pressure, the bulk of acrylic acid emissions should end up in water or soil, where it is susceptible to biodegradation. Acrylic acid would not be expected to bioaccumulate in marine or terrestrial organisms.

### SELECTED REFERENCES:

2, 5, 7

# ACRYLONITRILE

Synonyms: Carbacryl, Cyanoethylene, ENT 54, Fumigrain, Vinyl Cyanide

LA DEQ Regulatory Classification: Class 2

CAS Registry Number: 107131

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## PHYSICAL PROPERTIES:

Physical state:	Colorless liquid
Odor:	Mild
Boiling point:	77.3° C at 760mm Hg
Vapor pressure:	100 mm Hg at 25° C
Half-life (clean air)	3.5 days
(poll. air = 1/10)	

## TOXICOLOGICAL PROPERTIES:

Acrylonitrile can enter the body through inhalation or ingestion of contaminated water, or food which has been in contact with plastic containers in which acrylonitrile monomer has leached out. The population at greatest risk of exposure are those working in industrial facilities using acrylonitrile, but the general population living within 30 km of an industrial plant which uses or manufactures acrylonitrile may be exposed to atmospheric levels as high as 20  $\mu\text{g}/\text{m}^3$ . Acrylonitrile closely resembles hydrocyanic acid in its toxic action. By inhibiting the respiratory enzymes of tissue, it renders the tissue cells incapable of oxygen absorption. Poisoning is acute, there is little evidence of cumulative action on repeated exposure. Symptoms of exposure to low levels of acrylonitrile include flushing of the face, eye and nose irritation, followed by nausea, weakness, vomiting, headache, or diarrhea. Considered a probable human carcinogen.

IARC Classification.....	2A
EPA Class.....	B1
EPA Health Effects Doc...	Chron., Acute, Devel. toxicity
ACGIH TLV.....	Suspect. carcinogen. TWA 2 ppm (skin)
OSHA PEL.....	TWA 2 ppm; CL 10 ppm/10 min.

## PRINCIPAL SOURCES:

Acrylonitrile is a very high production chemical (2.3 billion lbs in 1985) used in the manufacture of acrylic and modacrylate fibers, ABS and SAN resins, adiponitrile, acrylamide, and other chemicals and resins. In industrial processes, it may be released as fugitive emissions or in wastewater. Other sources of acrylonitrile include auto exhaust, cigarette smoke, and outgassing or leaching from acrylic plastics. Annual emissions in the U. S. are estimated to be 2298 million tons.

## ALLYL CHLORIDE

Synonyms: Chloroallylene, 3-Chloro-1-propene, 3-Chloroprene, NCI-C04615,  
1-Chloro-2-propene, 3-Chloropropylene, 2-Propenyl chloride

LA DEQ Regulatory Classification: Class 2

CAS Registry Number: 107051

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### PHYSICAL PROPERTIES:

Physical state:	Colorless, yellow, or purple liquid
Odor:	Strong, unpleasant
Boiling point:	44.6° C at 760mm Hg
Vapor pressure:	295 mm Hg at 20° C
Half-life (clean air) (poll. air = 1/10)	n/a

### TOXICOLOGICAL PROPERTIES:

The vapors of allyl chloride are quite irritating to the eyes, nose, and throat and contact with the liquid will irritate the skin. Direct contact, in addition to vasoconstriction and numbness, may lead to rapid absorption and distribution throughout the body. If remedial measures are not taken promptly, such contact may result in burns and internal injuries. Inhalation may cause headache, dizziness, and in high concentrations, loss of consciousness. Acute exposure in experimental animals has resulted in marked inflammation of lungs, irritation of skin and swelling of the kidneys. Chronically exposed animals have shown degenerative changes in the liver and kidneys. Allyl chloride is a mutagen and may damage a developing fetus if exposure occurs during pregnancy.

EPA Classification... B2  
EPA HEEP Listing..... Devel., Chronic, Neuro, Aquatic  
ACGIH TLV..... TWA 1 ppm; STEL 2 ppm  
OSHA PEL..... TWA 1 ppm

### PRINCIPAL SOURCES:

Allyl chloride is used as a chemical intermediate in the manufacture of allyl compounds.

### ENVIRONMENTAL FATE:

The predominant removal mechanism for allyl chloride released into water or shallow soils is evaporation. Fate in the atmosphere is not well documented.

### SELECTED REFERENCES:

2, 5, 7

# AMMONIA

Synonyms: Ammonia anhydrous, Ammonia gas, Spirit of Hartshorn

LA DEQ Regulatory Classification: Class 3

CAS Registry Number: 7664417

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## PHYSICAL PROPERTIES:

Physical state:	Colorless gas
Odor:	Strong, irritating
Boiling point:	-33.4° C at 760 mm Hg
Vapor pressure:	76,000 mm Hg at 25.7° C
Half-life (clean air) (poll. air = 1/10)	n/a

## TOXICOLOGICAL PROPERTIES:

Poisonous through ingestion, and highly irritating to the eyes, nose, throat and lungs when inhaled or upon contact with vapors. High exposures cause coughing and shortness of breath, and may result in pulmonary edema which can cause death. Long-term exposure can cause chronic irritation of the eyes, nose, mouth, and throat.

ACGIH TLV... TWA 25 ppm; STEL 35 ppm  
OSHA PEL.... TWA 50 ppm

## PRINCIPAL SOURCES:

Ammonia is abundant in the atmosphere due to natural and man-produced emissions. Ammonia is produced by the natural decay of organic material, by the combustion of organic materials, and through the many uses of ammonia by man. Some of these uses include the production of fertilizer, plastics, dyes, textiles, and cleaning products. Ammonia also occurs in emissions from waste treatment facilities.

## ENVIRONMENTAL FATE:

Vast amounts of ammonia are released into the atmosphere through both natural processes and man-produced sources. Some ammonia will wash out in rainfall, and some will combine with sulfates and chlorides which will adsorb onto particulates and settle out. Ammonia released into water may be taken up by plants and algae, or may combine with anions to form salts, providing a "sink" for this compound.

## SELECTED REFERENCES:

2, 5, 7

# ANILINE

Synonyms: Aminobenzene, Aminophen, Benzenamine, Blue oil, Phenylamine

LA DEQ Regulatory Classification: Class 2

CAS Registry Number: 62533

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## PHYSICAL PROPERTIES:

Physical state:	Colorless to brown, oily liquid
Odor:	Weak, fishy
Boiling point:	184.4° C at 760mm Hg
Vapor pressure:	1 mm Hg at 34.8° C
Half-life (clean air)	3.3 hours
(poll. air = 1/10)	

## TOXICOLOGICAL PROPERTIES:

Aniline may be ingested, inhaled, or absorbed through the skin. Aniline affects the blood's ability to carry oxygen, resulting in blue coloration of the lips and skin. High exposure can cause death. Other symptoms of exposure include headaches, weakness, irritability, drowsiness, and shortness of breath. Contact can cause eye irritation and damage. Aniline causes mutations, reproductive disorders, and is a possible carcinogen.

IARC Classification... 3  
EPA HEEP Listing..... Acute, Chronic  
ACGIH TLV..... TWA 2 ppm  
OSHA PEL..... TWA 5 ppm (skin)

## PRINCIPAL SOURCES:

Aniline is used in the manufacture of polyurethanes, rubber processing chemicals, pesticides, fibers, dyes and pigments, hydroquinone, and pharmaceuticals. Wastewater releases, and emissions from its manufacture, transport, storage, and use are likely sources of environmental release.

## ENVIRONMENTAL FATE:

Aniline is produced in large quantities and is released to the environment primarily in wastewater, where it will diminish due to biodegradation and photooxidation. It will not bioconcentrate in fish. If spilled on land, it will be lost by a combination of biodegradation, oxidation, and chemical binding to components of the soil. In cases where it leaches into ground water, it will probably biodegrade, though slowly. If released into air, aniline will photodegrade through reaction with photochemically produced hydroxyl radicals.



## **ANTIMONY** (and compounds)

Related Compounds: Antimony (III) chloride, Antimony (V) chloride, Antimony lactate, Antimony nitrate, Antimony pentasulfide, Antimony tribromide, Antimony tartrate, Antimony dimercaptosuccinate, Antimony oxide

Regulatory Classification: Class 2

CAS Registry Number: 7440360

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### **PHYSICAL PROPERTIES:**

Physical state:	Grey metallic or yellow crystal
Odor:	None
Melting point:	630° C at 760mm Hg
Vapor pressure:	1 mm Hg at 25° C
Half-life (clean air) (poll. air = 1/10)	n/a

### **TOXICOLOGICAL PROPERTIES:**

Antimony may be ingested, absorbed through the skin, or inhaled as dust. Exposure can cause metallic taste, nausea, sore throat and irritation of the air passages. Higher levels can cause congestion of the lungs and may cause the heart to beat irregularly or stop altogether. Skin or eye contact causes irritation. Repeated or prolonged contact causes an itchy rash. Repeated exposure can cause headaches, poor appetite, dry throat and loss of sleep. Damage to the liver and heart muscle may also occur.

EPA HEEP Listing... Repro., Chronic  
ACIH TLV..... TWA 0.5 mg (Sb)/m<sup>3</sup>  
OSHA PEL..... TWA 500 µg (Sb)/m<sup>3</sup>

### **PRINCIPAL SOURCES:**

Antimony is used to make metal alloys, enamels, rubber compounds and matches.

### **ENVIRONMENTAL FATE:**

Information not available.

### **SELECTED REFERENCES:**

2, 5

## ARSENIC (and compounds)

Related compounds: Arsenic acid, Arsenical dust, Arsenic pentasulfide, Arsenic phosphate, Arsenic sulfide, Arsenic trioxide

LA DEQ Regulatory Classification: Class 1

CAS Registry Number: 7440382

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### PHYSICAL PROPERTIES:

Physical state:	Usually found as a compound (contaminant)
Odor:	n/a
Boiling point:	n/a
Vapor pressure:	n/a
Half-life (clean air) (poll. air = 1/10)	n/a

### TOXICOLOGICAL PROPERTIES:

Arsenic enters the body principally through the mouth, either in food or in water. Most ingested arsenic is quickly absorbed through the stomach and intestines and enters the blood stream. When taken by mouth, common acute effects include pain, nausea, vomiting, and diarrhea. Chronic effects include decreased production of red and white blood cells, abnormal heart function, blood vessel damage, liver and kidney injury, and impairment of nerve function. Inhalation exposure to inorganic arsenic dusts and fumes sometimes produces the same types of systemic health effects produced by oral exposure, but the greatest concern in inhalation exposure is the ability of inhaled arsenic to increase the risk of lung cancer. The amount of arsenic intake that is required to cause a harmful effect depends on the chemical and physical form of the arsenic. In general, inorganic forms of arsenic are more toxic than organic forms, and more soluble forms tend to be more toxic than insoluble forms. Human carcinogen by various routes.

IARC Classification...	1
EPA Class.....	1
ATSP.....	Devel., Neuro., Acute, Chronic
ACGIH TLV.....	TWA 0.2 mg(As)/m <sup>3</sup>
OSHA PEL.....	TWA 0.01 mg(As)/m <sup>3</sup>

### PRINCIPAL SOURCES:

In the U.S., arsenic is used primarily in wood preservatives and agricultural chemicals. No arsenic is produced in the U.S., but in 1986, nearly 28,000 Mg was imported. In addition to preserving and agricultural uses, arsenic is

## ASBESTOS

(friable)

Synonyms: Amosite, Anthophyllite, Chrysotile, Crocidolite

LA DEQ Regulatory Classification: Class 1

CAS Registry Number: 1332214

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### PHYSICAL PROPERTIES:

Physical state:	friable solid
Odor:	none
Boiling point:	n/a
Vapor pressure:	n/a
Half-life (clean air)	n/a
(poll. air = 1/10)	

### TOXICOLOGICAL PROPERTIES:

Asbestos is the name for a group of natural minerals that separate into strong, very fine fibers. The physical properties that give asbestos its resistance to heat and decay are linked with several adverse human health effects. Asbestos tends to break into a dust of microscopic fibers. Because of their size and shape, these fibers can remain suspended in the air for long periods of time and can easily penetrate body tissues when inhaled. Because of their durability, these fibers can remain in the body for many years. Asbestos is known to cause asbestosis and various forms of cancer. Asbestosis is a chronic disease of the lung which makes breathing progressively more difficult and can lead to death. Breathing asbestos also can cause mesothelioma, a cancer of the chest and abdominal membranes. Other cancers, primarily of the digestive tract, are also associated with exposure to asbestos. These diseases have a long latency period (10 to 40 y). Because asbestos fibers remain in the body, each exposure increases the burden of asbestos.

IARC Classification.. 1  
EPA Class..... A  
ACGIH TLV..... Human Carcinogen  
OSHA Standard..... TWA - 2 million fb/m<sup>3</sup> ; CL - 10 million fb/m<sup>3</sup>

### PRINCIPAL SOURCES:

Asbestos has been used in a wide variety of products, including floor tiles and flooring, patching compounds, textured paints, friable ceilings, stove and furnace surrounds, insulation, roofing shingles, siding, brake shoes, and in appliances. Although there are several different types of asbestos, nearly 95% of all asbestos used in commercial products is a type called chrysotile, which does not break into as fine a particle as do the more dangerous amphiboles (Amosite and Crocidolite). Between 1900 and 1980, approximately 30 million

## **BARIUM** (and compounds)

Related Compounds: Barium azide, Barium bromate, Barium carbonate, Barium chloride, Barium cyanide, Barium fluoride, Barium nitrate, Barium(II) nitrate, Barium oxide, Barium sulfate, etc.

LA DEQ Regulatory Classification: Class 2

CAS Registry Number: 7440393

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### **PHYSICAL PROPERTIES:**

Physical state:	Silver-white metal
Odor:	None
Melting point:	725° C at 760mm Hg
Vapor pressure:	10 mm Hg at 25° C
Half-life (clean air) (poll. air = 1/10)	n/a

### **TOXICOLOGICAL PROPERTIES:**

Inhalation of dust or fumes can irritate the eyes, nose, and throat. Repeated high exposures can irritate the lungs, causing persistent coughing and abnormal X-ray. Very high exposure can cause barium poisoning with symptoms of vomiting, diarrhea, irregular heartbeat, paralysis, or death. Many compounds of barium (ex. Ba azide, Ba bromate, Ba chlorate, Ba nitrate, Ba perchlorate, and Ba permanganate), in addition to the forementioned effects, can cause organ damage upon exposure, and are explosive as well.

EPA HEA Doc...Devel., Chronic  
ACGIH TLV..... TWA 0.5 mg/m<sup>3</sup>

### **PRINCIPAL SOURCES:**

Barium is used in the manufacture of spark plugs, engine rod bearings, and to remove gas from vacuum tubes. Compounds of barium are used in a wide variety of products such as dry cells, disinfectants, ceramics, electronics, explosives, and rocket fuels.

### **ENVIRONMENTAL FATE:**

Because barium is an elemental mineral, it does not undergo degradation, except to compounds such as oxides. It therefore is not removed except by physical processes such as burial in sediments. Barium released into air would be expected to settle out in the vicinity of the release by gravitational settling or adsorption to particles in the air. Some of the salts of barium, such as sulfates and chlorides, are water soluble and pose a threat to aquatic organisms, with the possibility of bioaccumulation.

# BENZENE

Synonyms: Benzol, Coal naphtha, Mineral naphtha, Phenyl hydride

LA DEQ Regulatory Classification: Class 1

CAS Registry Number: 71432

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## PHYSICAL PROPERTIES:

Physical state:	Clear, colorless liquid
Odor:	Aromatic
Boiling point:	80.1° C at 760mm Hg
Vapor pressure:	100 mm Hg at 26.1° C
Half-life (clean air)	21.9 days
(poll. air = 1/10)	

## TOXICOLOGICAL PROPERTIES:

Can be absorbed into the body through ingestion, inhalation, and dermal contact (most common-inhalation due to high volatility). Metabolism occurs in the liver, producing harmful metabolites capable of causing blood disorders (pancytopenia), immunotoxicity, and neurotoxic effects. Epidemiology studies indicate prolonged low-level exposure is carcinogenic in humans. In high-level exposure, acute benzene lethality is attributed to asphyxiation, respiratory arrest, CNS depression, or cardiac arrhythmia.

IARC Classification... 1  
EPA Classification..... A  
ACGIH TLV..... TWA 10 ppm (suspect. human carcinogen)  
OSHA PEL..... TWA 1 ppm/8 hr.

## PRINCIPAL SOURCES:

Derived primarily from petroleum sources. Used as a chemical intermediate in the manufacture of various plastics, synthetic rubbers and fibers, and resins, which are used in a wide variety of consumer goods. Other uses for benzene include dyes, drugs, pesticides and other agricultural chemicals. Widely used as additive in gasoline (<1% to 5%).

## ENVIRONMENTAL FATE:

Benzene is released into the environment by natural (crude oil seeps, forest fires, and plant volatiles) and man-made sources. Annual anthropogenic emissions are approximately 236,000 metric tons. Chemical degradation reactions, primarily the reaction with the hydroxyl radical, limit the atmospheric residence time to only a few days, or hours - if the concentration of hydroxyl radicals is sufficiently high. Biodegradation, principally aerobic, is the most important environmental fate mechanism for water- and soil- associated benzene.

## **BERYLLIUM**

(and compounds)

Related compounds: Beryllium fluoride, Beryllium ammonium fluoride, Beryllium sulfate, Beryllium oxide, Beryllium hydroxide

Regulatory Classification: Class 1

CAS Registry Number: 7440417

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### **PHYSICAL PROPERTIES:**

Physical state:	Greyish-white, hard, light metal
Odor:	n/a
Boiling point:	1278° C
Vapor pressure:	n/a
Half-life (clean air) (poll. air = 1/10)	n/a

### **TOXICOLOGICAL PROPERTIES:**

Overexposure to beryllium or its associated compounds can severely irritate the airways and lungs, causing nasal discharge, tightness in the chest, cough, shortness of breath, and/or fever. Future exposures can cause further attacks. Symptoms may be delayed for days after exposure, and can result in lung scarring as well. Eye irritation, itching and burning can occur on contact. Beryllium is a probable cancer causing agent in humans. Several cases of localized granulomatous lesions following penetration of the skin by fluorescent light tube shards have been reported, and similar cases of beryllium granulomas have been reported in persons residing near processing plants and in families of beryllium workers. Exposure to oxide occurring in the casting of Be alloys and even exposure to alloys of low Be content has been shown to be dangerous.

NTP Classification.....	CS
IARC Classification...	2A
EPA Classification.....	B1
ACGIH TLV.....	TWA 0.002mg(Be)/m <sup>3</sup>
OSHA PEL.....	TWA 0.002mg(Be)/m <sup>3</sup> ; CL 0.005

### **PRINCIPAL SOURCES:**

Beryllium is a naturally occurring metal which is mined for use in manufacturing electrical components, chemicals, ceramics, and x-ray tubes. Compounds of beryllium are used in the manufacture of beryllium metal and as reagents.

## BIPHENYL

Synonyms: Bibenzene, 1,1'-Biphenyl, Diphenyl, Lemonene, Phenylbenzene, PHPH

LA DEQ Regulatory Classification: Class 2

CAS Registry Number: 92524

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### PHYSICAL PROPERTIES:

Physical state:	White scales
Odor:	Pleasant
Boiling point:	255° C
Vapor pressure:	n/a
Half-life (clean air)	n/a
(poll. air = 1/10)	

### TOXICOLOGICAL PROPERTIES:

Toxic by ingestion or inhalation. A powerful irritant when inhaled. Human systemic effects from even small exposure include flaccid paralysis, nausea or vomiting, and gastrointestinal effects. Laboratory experiments indicate that biphenyl is mutagenic. It is also combustible and reactive.

ACGIH TLV... TWA 0.2 ppm  
OSHA PEL.... TWA 0.2 ppm

### PRINCIPAL SOURCES:

Biphenyl is used in the synthesis of organic chemicals. It is used as a heat transfer agent, fungistat in packaging of citrus fruit, a plant disease control, and as a dyeing assistant for polyesters. Biphenyl is also found in coal tar and in wood preservative sludge as a by-product of the heating of benzene constituents in coal and wood.

### ENVIRONMENTAL FATE:

Biphenyl in waste water can be biodegraded, specially with acclimated microbes. In lake or stream waters this process will occur much more slowly. The fate of biphenyl in air is not documented.

### SELECTED REFERENCES:

2, 7, 8

## ENVIRONMENTAL FATE:

Bis (2-chloroethyl) ether (BCEE) is most likely released to the environment from the use of products containing the compound. Release of BCEE to water is expected to result in hydrolysis and volatilization. Aqueous photolysis and photooxidation are not expected to be important processes in the aquatic fate of BCEE. The low vapor pressure (0.71 mm Hg at 25° C) suggests that volatilization from the soil or water, while slow, could be significant. When released to soil, BCEE may hydrolyze and is expected to leach extensively to groundwater. A half-life of 13.44 hours was estimated for the reaction of BCEE with photochemically produced hydroxyl radicals in the atmosphere. Because BCEE is quite soluble in water, it is expected that BCEE in air would be removed by wet deposition, resulting in a cycle between water, soil, and air. The relative distribution between these phases, however, is not known. Bioconcentration in aquatic organisms is extremely low. Monitoring studies indicate that BCEE is a contaminant in the air, soil, and water. Human exposure probably results primarily from drinking water contaminated with BCEE.

## SELECTED REFERENCES:

1, 2, 3



## 1,3-BUTADIENE

Synonyms: Biethylene, BivinyI, Buta-1,3-diene, Erythrene, NCI-C50602, Vinyl Ethylene

La DEQ Regulatory Classification: Class 2

CAS Registry Number: 106990

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### PHYSICAL PROPERTIES:

Physical state:	Colorless liquid or gas
Odor:	Mild, aromatic
Boiling point:	-4.5° C.
Vapor pressure:	1840 mm Hg at 25° C
Half-life (clean air) (poll. air ~1/10)	n/a

### TOXICOLOGICAL PROPERTIES:

Exposure to individuals is through inhalation of gas. Contact with liquid would irritate and freeze skin. Breathing the vapor can cause lightheadedness or unconsciousness. High exposure may cause death. Exposure to vapors may also irritate eyes, nose, and throat. 1,3-Butadiene may be carcinogenic, therefore, there is no safe level of exposure. It is also highly flammable and explosive. An established animal carcinogen; possible human carcinogen.

IARC Classification... 2B  
EPA Classification... B2  
HEEP Listing..... Devel., Repro., Chronic., Neuro., Aquatic  
ACGIH TLV..... TWA 10 ppm; Suspected Carcinogen  
OSHA PEL..... TWA 1000 ppm

### PRINCIPAL SOURCES:

1,3-Butadiene is found in automobile emissions, petroleum, plastics, tobacco smoke, and is used in the manufacture of rubber products. Releases into the environment are associated with its manufacture, transport, storage, and end use in polymers and as a chemical intermediate.

### ENVIRONMENTAL FATE:

Due to its high vapor pressure and low boiling point, 1,3-Butadiene spilled onto land or released into the water will volatilize rapidly. In air, reaction with hydroxyl radicals is the dominant removal mechanism. Reaction with ozone and nitrate radicals may also contribute to atmospheric degradation. No information regarding biodegradation or bioconcentration is available at this time, but due to its structure and physical properties, 1,3-butadiene would be

## **CADMIUM**

(and compounds)

Related cmpds: Cd acetate, Cd amide, Cd azide, Cd chloride, Cd dicyanide,  
Cd fluoride, Cd nitrate, Cd nitrite, Cd oxide, Cd sulfate, Cd sulfide

LA DEQ Regulatory Classification: Class 1

CAS Registry Number: 7440439

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### **PHYSICAL PROPERTIES:**

Physical state:	Silver to white solid
Odor:	n/a
Boiling point:	n/a
Vapor pressure:	n/a
Half-life (clean air)	n/a
(poll. air = 1/10)	

### **TOXICOLOGICAL PROPERTIES:**

Cadmium may enter the body through inhalation of compound particulates, or ingestion in food or water. For most people, food is the primary source, since food materials tend to take up and retain cadmium. Usually only about 5% of what is taken in by mouth is absorbed into the blood, while about 30 to 50% of that which is inhaled is taken up into the blood. Very little cadmium is taken up through the skin. Long-term, low-level exposure to cadmium is of greatest concern to public health, since high-level acute exposure is rare. Health effects from chronic exposure include kidney damage, lung damage such as emphysema, high blood pressure, and lung cancer. Other tissues reported to be injured by cadmium exposure in animals include the liver, the testes, the immune system, the nervous system, and the blood. Reproductive and developmental effects have been observed in animals treated with cadmium, but these have not been reported in humans.

IARC Classification...	2A
EPA.....	B1
ATSTP.....	Devel., Repro., Acute
ACGIH TLV.....	TWA 0.1 mg(Cd)/m <sup>3</sup> (dust)
OSHA PEL.....	TWA 0.1 mg(Cd)/m <sup>3</sup>
	CL 0.6 mg(Cd)/m <sup>3</sup> (fume)

### **PRINCIPAL SOURCES:**

The largest anthropogenic source of atmospheric cadmium (more than 100 Mg/year) is fossil fuel combustion. Approximately 75% of the fossil fuel emissions come from coal combustion, the remainder being composed of industrial, commercial, and residential burning of oil or petroleum products. Other significant sources include smelting and burning of municipal wastes and

# CARBON TETRACHLORIDE

Synonyms: Benzinoform, Carbon tet, Perchloromethane, Tetrachlorocarbon

LA DEQ Regulatory Classification: Class 2

CAS Registry Number: 56235

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## PHYSICAL PROPERTIES:

Physical state:	Colorless liquid
Odor:	Aromatic, sweet
Boiling point:	76.5° C at 760mm Hg
Vapor pressure:	91.3 mm Hg at 20° C
Half-life (clean air)	80 years
(poll. air = 1/10)	

## TOXICOLOGICAL PROPERTIES:

Can be absorbed into the body through ingestion, inhalation, and dermal contact, but is readily excretable. Acute effects from drinking or breathing concentrated amounts include dizziness, headaches, and nausea, with injury to the liver and kidneys. The primary sites of damage in the body are the liver, kidney, and brain, and with frequent or large doses, permanent damage can result.

NTP Classification.... CS  
IARC Classification... 2B  
EPA Class..... B2  
EPA HEA Listing..... Devel., Acute, Chronic, Neuro., Aquatic  
ACGIH TLV..... TWA 5 ppm; STEL 30 (skin)  
OSHA PEL..... TWA 10 ppm; CL 25 ppm

## PRINCIPAL SOURCES:

Carbon tetrachloride is produced by the exhaustive chlorination of low molecular weight hydrocarbons such as carbon disulfide, methanol, methane, propane, and ethylene dichloride. Although usage is decreasing, it is still used as a solvent, and in the manufacture of refrigerants.

## ENVIRONMENTAL FATE:

Because carbon tetrachloride is listed as a hazardous substance, disposal of waste  $\text{CCl}_4$  is controlled by a number of Federal regulations. Releases to land and water may result from spills or runoff from dump sites, and fugitive emissions from industries still occur. Carbon tetrachloride is a stable chemical that is degraded very slowly, so there has been a gradual accumulation of  $\text{CCl}_4$  in the environment as a consequence of human activities. Because  $\text{CCl}_4$  is readily volatile at ambient temperature, most exists in the air. Typical background levels in rural areas are about  $1 \mu\text{g}/\text{m}^3$ , with somewhat higher levels in urban areas and near industrial sources.

## CARBONYL SULFIDE

Synonyms: Carbon oxide sulfide, Carbon oxysulfide, Oxycarbon sulfide

LA DEQ Regulatory Classification: Class 3

CAS Registry Number: 463581

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### PHYSICAL PROPERTIES:

Physical state:	Colorless gas or refrig. liquid
Odor:	Sulfide odor
Boiling point:	49.9° C at 760mm Hg
Vapor pressure:	n/a
Half-life (clean air) (poll. air =1/10)	n/a

### TOXICOLOGICAL PROPERTIES:

Carbonyl sulfide may enter the body through inhalation or absorption through the skin. Contact with the liquid or concentrated vapor can burn the eyes and skin. Inhalation can irritate the nose, throat, and lungs causing cough and sneezing. High exposure causes salivation, nausea, vomiting, diarrhea, sweating, weakness and stomach cramps. Carbonyl sulfide also has narcotic effects, causing dizziness, confusion, unconsciousness, even death. Long-term exposure may damage the liver, affect the brain, or cause hardening of the arteries.

### PRINCIPAL SOURCES:

Carbonyl sulfide is primarily used in the manufacture of other chemicals. It is also generated naturally from the soil.

### ENVIRONMENTAL FATE:

Information not available.

### SELECTED REFERENCES:

2, 5, 7

# CHLORINE

Synonyms: Bertholite, Chlorine mol., Molecular chlorine

Regulatory Classification: Class 3

CAS Registry Number: 7782505

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## PHYSICAL PROPERTIES:

Physical state:	Greenish-yellow gas
Odor:	Strong, characteristic, irritating
Boiling point:	-34.5° C at 760mm Hg
Vapor pressure:	4800 mm Hg at 20° C
Half-life (clean air) (poll. air = 1/10)	n/a

## TOXICOLOGICAL PROPERTIES:

Moderately toxic to humans by inhalation, at low levels of exposure. Chlorine is a very irritating gas; human respiratory effects include changes in the trachea or bronchi, emphysema, chronic pulmonary edema or congestion. A strong irritant to the eyes and mucous membranes. These effects are felt at concentration levels of 3 ppm. Upon contact with moisture, chlorine gas reacts to form oxygen and hydrochloric acid, which in quantity causes inflammation of tissues contacted. Because of its intensely irritating properties, severe industrial exposure seldom occurs, as the worker is forced to leave the exposure area before he can be seriously affected. In cases where this is impossible, the initial irritation of the eyes and mucous membranes of the nose and throat is followed by coughing, a feeling of suffocation, and later, pain and constriction of the chest. If exposure has been severe, pulmonary edema, possibly leading to death, may follow. Animal studies indicate chlorine may be a mutagen. A common air contaminant.

ACGIH TLV... TWA CL 1 ppm  
OSHA PEL.... TWA 0.5 ppm; STEL 1 ppm

## PRINCIPAL SOURCES:

Chlorine was the eighth highest-volume chemical produced in the U.S. in 1979. It is produced generally through electrolysis of brine or hydrochloric acid. Chlorine is used in the production of a wide range of chlorinated organic and non-organic chemicals, such as carbon tetrachloride, trichloroethylene, polychloroprene (neoprene), polyvinyl chloride, hydrogen chloride, ethylene dichloride, metallic chlorides, and chlorobenzene, to name a few. Chlorine is also widely used in water purification, flame-retardant compounds, in some batteries, and in food processing. Do to its wide use, chlorine is extensively transported by barge, railcar, and truck. Probably the greatest threat to humans lies in the possibility of an accidental release of large quantities of chlorine in a

## CHLORINATED DIBENZO-P-DIOXINS/FURANS

Synonyms: 2,3,7,8-Tetrachlorodibenzo-p-dioxin, 2,3,7,8-TCDD, TCDBD,  
2,3,7,8-Tetrachlorodibenzodioxin, Dioxin

LA DEQ Regulatory Classification: Class 2

CAS Registry Number: 1746016

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### PHYSICAL PROPERTIES:

Physical state:	Colorless solid
Odor:	None
Melting point:	305° C
Vapor pressure:	$1.52 \times 10^{-9}$ mm Hg at 25° C
Half-life (clean air) (poll. air = 100)	n/a

### TOXICOLOGICAL PROPERTIES:

The greatest risk of exposure to 2,3,7,8-TCDD in humans is through ingestion of trace amounts in food, although a much smaller percentage may be present in drinking water in certain areas, or in the air. In humans, exposure to 2,3,7,8-TCDD has been demonstrated to cause a persistent, disfiguring clone termed chloracne. Animal studies suggest that other possible human effects include liver damage, weight loss, digestive disorders, toxicity to immune systems, spontaneous abortions, birth defects, and cancer. The reason that 2,3,7,8-TCDD is considered so dangerous is that harmful effects have been demonstrated for exposure to trace amounts of this substance. For cancer, the U.S. EPA has estimated that lifetime exposure to 1 nanogram of 2,3,7,8-TCDD per kilogram body weight per day would result in 1,560 additional cases of cancer in a population of 10,000 (15.6%). (A nanogram is one-billionth of a gram.)

IARC Classification... 2A

EPA Classification..... B2

EPA HEA Listing..... Repro., Acute, Chronic, Neuro.

### PRINCIPAL SOURCES:

The chlorinated dibenzo-p-dioxins are a class of compounds that are loosely referred to as dioxins. There are 75 possible dioxins, of which 2,3,7,8-TCDD is but one. The main environmental sources of 2,3,7,8-TCDD are; the use of herbicides containing 2,4,5-trichlorophenoxy acids (2,4,5-T), the production and use of 2,4,5-trichlorophenol in wood preservatives, production and use of hexachlorophene as a germicide, pulp and paper manufacturing, incineration of municipal and chlorinated industrial wastes, accidental transformer/capacitor fires involving chlorinated benzenes and biphenyls, and improper disposal of certain chlorinated chemical wastes. Although 2,4,5-T, 2,4,5-trichlorophenol

## CHLORINE DIOXIDE

Synonyms: Alcide, Anthium dioxide, Chlorine peroxide, Chlorin(IV) oxide, Chloryl radical, Chloroperoxy, Dioxide 50

Regulatory Classification: Class 2

CAS Registry Number: 10049044

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### PHYSICAL PROPERTIES:

Physical state:	Red-yellow gas, or orange-red crystals
Odor:	n/a
Boiling point:	9.9° C at 760mm Hg
Vapor pressure:	n/a
Half-life (clean air) (poll. air = 1/10)	n/a

### TOXICOLOGICAL PROPERTIES:

Chlorine dioxide is listed as a hazardous chemical primarily due to its instability at ambient temperature and pressure, and its extreme reactivity with a variety of substances, including water, organic matter, non-metals, and carbon monoxide. If inhaled, the fumes are extremely irritating and caustic. This is due to the fact that upon contact with moist conditions such as exists in the lung, chlorine dioxide reacts to produce hydrochloric acid. In laboratory experiments, chlorine dioxide exposure has been shown to produce adverse reproductive effects in animals, and mutagenic effects as well.

ACGIH TLV...TWA 0.1 ppm; STEL 0.3 ppm  
OSHA PEL... TWA 0.1 ppm

### PRINCIPAL SOURCES:

Chlorine dioxide is used primarily in the bleaching process for paper products. Any releases of chlorine dioxide into the environment would occur in the manufacture, transport, storage, and use of this chemical in the bleaching process.

### ENVIRONMENTAL FATE:

Due to the reactivity of this compound with water, most releases of chlorine dioxide would be reduced to hydrochloric acid. The greatest environmental threat posed by chlorine dioxide is in the event of a spill or accident involving an uncontrolled release of a large quantity of this substance. Environmental fate of chlorine dioxide is not well documented.

### SELECTED REFERENCES:

## CHLOROETHANE

Synonyms: Ethyl chloride, Chloroethyl, Chloryl, Ether muriatic, Kelene

LA DEQ Regulatory Classification: Class 2

CAS Registry Number: 75003

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### PHYSICAL PROPERTIES:

Physical state:	Colorless gas
Odor:	Characteristic sharp
Boiling point:	12.4° C at 760mm Hg
Vapor pressure:	1008 mm Hg at 20° C
Half-life (clean air) (poll. air = 1/10)	40 days

### TOXICOLOGICAL PROPERTIES:

Can be absorbed into the body through ingestion, inhalation, and dermal contact, but is readily excretable. Most likely route of entry is through inhalation of vapor. Chloroethane has been used as an anesthetic, and overexposure can result in a feeling of drunkenness, loss of muscle coordination, or unconsciousness. Chloroethane has caused cancer in test animals. Effects of chronic exposure in humans is not known.

EPA Classification... C  
ACGIH TLV..... TWA 1000 ppm  
OSHA PEL..... TWA 1000 ppm

### PRINCIPAL SOURCES:

The major use for chloroethane has been as an intermediate in the production of tetraethyl lead, a longtime additive to gasoline. As leaded gasoline use has declined, so has U.S. production of chloroethane (from 339.2 million lb in 1982, to 164.4 million lb in 1987). There are several medical uses for chloroethane, including its use as an anesthetic, pain medication, and as a skin cooling agent. It is also used as a refrigerant, and is released as a combustion product.

### ENVIRONMENTAL FATE:

Most chloroethane released to the environment ends up in the atmosphere, due to the high vapor pressure of this compound. In the atmosphere, the dominant removal mechanism is by reaction with photochemically produced hydroxyl radical.

### SELECTED REFERENCES:

1, 2



## CHLOROFORM

Synonyms: Methyl trichloride, TCM, Trichloroform, Trichloromethane, NCI-CO2686

LA DEQ Regulatory Classification: Class 2

CAS Registry Number: 67663

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### PHYSICAL PROPERTIES:

Physical state:	Colorless liquid
Odor:	Pleasant, non-irritating
Boiling point:	61.26° C at 760mm Hg
Vapor pressure:	100 mm Hg at 25° C
Half-life (clean air) (poll. air = 1/10)	278 days

### TOXICOLOGICAL PROPERTIES:

Can be absorbed into the body through ingestion, inhalation, and dermal contact. Human exposure to chloroform results to a large extent from the by-product of chlorination in disinfecting water, and to a lesser degree, natural components in food. Chloroform effects the central nervous system, liver, and kidneys. It was used as a surgical anesthetic for many years before its harmful effects on the liver and kidneys were recognized. Short-term exposure to high concentrations in the air causes tiredness, dizziness, and headache. Longer-term exposure can effect liver and kidney function. Toxic effects may include jaundice and burning urination. High doses of chloroform have also been found to cause cancer in experimental animals. A suspected human carcinogen.

NTP Classification.....	CS
IARC Classification....	2B
EPA Classification.....	B2
ATSDR Listing.....	Devel., Repro., Chronic
ACGIH TLV.....	TWA 10 ppm
OSHA PEL.....	CL 50 ppm

### PRINCIPAL SOURCES:

The primary use for chloroform is in the production of fluorocarbon-22, a refrigerant. It is also used as an extraction solvent, in the manufacture of pharmaceuticals, lacquers, resins, adhesives, pesticides, textiles, paper, and as a fumigant. Releases to the environment during the manufacture, storage, and use of chloroform make up the bulk of emissions, but other sources of chloroform in the environment include, water chlorination, municipal wastewater treatment, and automobile exhaust.

# CHLOROMETHANE

Synonyms: Methyl chloride, Monochloromethane

Regulatory Classification: Class 2

CAS Registry Number: 74873

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## PHYSICAL PROPERTIES:

Physical state:	Colorless gas
Odor:	Chloroform-like
Boiling point:	-27.3° C at 760mm Hg
Vapor pressure:	mm Hg at 25° C
Half-life (clean air) (poll. air = 1/10)	n/a

## TOXICOLOGICAL PROPERTIES:

Chloromethane can enter the body through inhalation. Since it has very slight irritative properties, it may be inhaled without noticeable discomfort. Repeated exposure to low concentrations causes damage to the CNS, and, less frequently, to the liver, kidneys, bone marrow, and cardiovascular system. Hemorrhages into the lungs, intestinal tract, and dura have been reported. In exposures to high concentrations, dizziness, drowsiness, incoordination, confusion, nausea and vomiting, abdominal pains, delirium, convulsions, and coma may occur. Death may follow several days after exposure, resulting from degenerative changes in the heart, liver, and especially the kidneys.

EPA Classification.... C  
ACGIH TLV..... TWA 50 ppm; STEL 100 ppm (skin)  
OSHA PEL..... TWA 100 ppm; CL 200 ppm

## PRINCIPAL SOURCES:

Chloromethane is used in the manufacture of silicones, tetraethyllead, synthetic rubber, methyl cellulose, refrigerants, numerous organic chemicals (methylene chloride, chloroform, carbon tetrachloride, etc.), fumigants, herbicides, and medicines. It also has numerous uses as a solvent, extractant, propellant, and fluid. It is also found in cigarette smoke. Due to the quantities generated and its wide range of uses, airborne chloromethane is found in many areas of the country.

## ENVIRONMENTAL FATE:

The primary removal mechanism for chloromethane released to water is volatilization. In air, the fate of chloromethane is undocumented.

# CHLOROPRENE

Synonyms: Neoprene, Chlorobutadiene, 2-Chloro-1,3-butadiene

LA DEQ Regulatory Classification: Class 2

CAS Registry Number: 126998

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## PHYSICAL PROPERTIES:

Physical state:	Colorless liquid
Odor:	n/a
Boiling point:	59.4° C at 760mm Hg
Vapor pressure:	174 mm Hg at 20° C
Half-life (clean air)	16 hours
(poll. air = 1/10)	

## TOXICOLOGICAL PROPERTIES:

Can be absorbed into the body through ingestion, inhalation, and dermal contact. Exposure to vapor first causes irritation of the respiratory tract, followed by depression of respiration and, if exposure is continued, asphyxia. The vapor is a CNS depressant; in animals it causes severe degenerative changes in the vital organs, particularly the liver and kidneys. Humans exposed to chloroprene have been reported to develop dermatitis, conjunctivitis, corneal necrosis, anemia, temporary loss of hair, nervousness and irritability. A suspected human carcinogen.

EPA Classification...	C
ACGIH TLV.....	TWA 10 ppm (skin)
OSHA PEL.....	TWA 25 ppm (skin)

## PRINCIPAL SOURCES:

Chloroprene is used almost exclusively in the production of polychloroprene elastomers. The primary source of environmental release of chloroprene may be in the effluent or emission from facilities which manufacture or use it.

## ENVIRONMENTAL FATE:

If released to the ground, chloroprene is expected to be susceptible to rapid volatilization and extensive leaching into ground water. If released to water, volatilization is expected to be the dominant removal mechanism. Therefore, chloroprene is expected to exist almost entirely in the vapor phase in the atmosphere. Chloroprene is predicted to be removed from the atmosphere by reaction with photochemically generated hydroxyl radicals and ozone. Chloroprene is not expected to undergo chemical hydrolysis, adsorb significantly to suspended solids or sediments, or to bioaccumulate in aquatic organisms.

## CHROMIUM IV (and compounds)

Related Compounds: Chromium acetate, Chromic acid, Chromium chloride,  
Chromium nitrate, Chromium oxide, Chromyl chloride,  
Chromyl nitrate, Chromyl perchlorate

LA DEQ Regulatory Classification: Class 1

CAS Registry Number: 7440473

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### PHYSICAL PROPERTIES:

Physical state:	Metal or compound (solid)
Odor:	n/a
Boiling point:	n/a
Vapor pressure:	n/a
Half-life (clean air (poll. air = 1:10))	n/a

### TOXICOLOGICAL PROPERTIES:

The general public is exposed to small amounts of chromium through inhalation, or ingesting water or food containing chromium. Occupational exposure to much higher concentrations occurs to people working in certain chromium industries. There are three major forms of chromium, chromium VI being the most toxic. Short-term high-level exposure to chromium VI can result in adverse effects at the site of contact, such as ulcers of the skin, irritation of the nasal mucosa, perforation of the nasal septum, and irritation of the digestive tract. Liver and kidney damage may also be a consequence. Long-term exposure to above-background levels of chromium has been associated with lung cancer. Based on data from humans exposed to chromium in the workplace, estimates by the EPA indicate that a lifetime exposure to 1 mg per cubic meter of air would result in 120 additional cases of cancer on a population of 10,000 (upper-limit estimates).

IARC Classification... 1  
EPA Classification..... A  
ACGIH TLV..... TWA 0.5 mg/m<sup>3</sup>  
OSHA PEL..... TWA 1 mg/m<sup>3</sup>

### PRINCIPAL SOURCES:

The two largest sources of chromium emissions into the atmosphere are from the chemical manufacturing industry and the combustion of natural gas, oil, and coal. Other sources include cement plants, brake lining wear, incineration of municipal waste and sewage sludge, emissions from air conditioning cooling towers that use chromium compounds as rust inhibitors, and various consumer products. Occupations which present risks of exposure to workers include

## **COPPER**

(and compounds)

Related compounds: Copper acetate, Copper arsenate hydroxide, Copper(I or II) chloride, Copper chromate, Copper(I) citrate, Copper cyanide, Copper fume, Copper(II) nitrate, Copper(II) oxide, Copper sulfate

LA DEQ Regulatory Classification: Class 2

CAS Registry Number: 7440508

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### **PHYSICAL PROPERTIES:**

Physical state:	Reddish metal or colored powder
Odor:	n/a
Melting point:	1083° C (metal)
Vapor pressure:	n/a
Half-life (clean air) (poll. air = 1:10)	n/a

### **TOXICOLOGICAL PROPERTIES:**

Copper oxide fumes may be responsible for one form of metal fume fever. In animals, inhalation of copper dust has caused damage to the blood cells, liver, lungs and pancreas. Copper chloride and sulfate have been reported as causing irritation of the skin and conjunctiva which may be of allergic basis. Cuprous oxide is irritative to the eyes and upper respiratory tract. In man, the ingestion of large amounts of copper sulfate result in damage to the nervous system and kidneys. Deaths have been reported after ingestion of as much as 27 grams of the copper salt. Although not directly connected to copper absorption, there is an excess of cancer cases in the copper smelting industry.

ACGIH TLV..... TWA (dust, mist) 1 mg(Cu)/m<sup>3</sup>; (fume) 0.2 mg/m<sup>3</sup>

### **PRINCIPAL SOURCES:**

Copper metal is an excellent conductor and is resistant to weathering. It is therefore widely used in applications requiring a malleable, durable metal, or a good conductor. Electric wiring, plumbing, heating, roofing and building construction are examples of applications for which copper has been used. The biggest environmental threat from these uses of copper lies in the releases of copper fumes or dust, primarily during the manufacture of these materials. Copper compounds are used in a variety of compounds and products. Copper has the ability to discourage rotting by microorganisms and insects. Copper compounds are used in the formulation of wood preservatives, fungicides, insecticides, and anti-fouling paints. Other compounds are used in feed additives and pharmaceuticals.

# CRESOL

Synonyms: Bacillol, ar-Toluenol

LA DEQ Regulatory Classification: Class 3

CAS Registry Number: 1319733

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## PHYSICAL PROPERTIES:

Physical state:	Clear or yellow to brown liquid
Odor:	Phenolic
Boiling point:	191-203° C
Vapor pressure:	1 mm Hg at 38-53° C
Half-life (clean air)	9 hours
(poll. air = 1/10)	

## TOXICOLOGICAL PROPERTIES:

Cresol is a mixture of isomeric cresols obtained from coal tar. It is one of many polynuclear aromatic hydrocarbons found in fossil fuels and biomass combustion processes. Cresol is moderately toxic by ingestion and skin contact. Physical contact will result in burns of the skin and mucous membranes, with possible permanent damage. Prolonged or repeated exposure can result in damage to the kidneys, liver, and nervous system. The main hazard accompanying its use in industry lies in severe chemical burns and dermatitis.

ACGIH TLV..... TWA 5 ppm  
OSHA PEL..... TWA 5 ppm (skin)

## PRINCIPAL SOURCES:

Cresols are products of petroleum and coal tar refining. They are used in the manufacture of organic chemicals and in wood processing. In addition to releases associated with these processes, cresols occur wherever petroleum products are used, such as: roadway runoff, from distillates, fuels, oils, lubricants, and laboratory chemicals. It is also found in automobile exhaust, metal cleaning and scouring compounds, and in components of domestic sewerage.

## ENVIRONMENTAL FATE:

The primary removal mechanism for cresols in water is biodegradation, which occurs most rapidly in aerated or quickly moving waters, and in the presence of acclimated microorganisms. Although data is lacking on the fate of cresols released onto land, it is likely that biodegradation occurs at a slower rate. In the atmosphere cresols react with photochemically produced hydroxyl radicals

## CUMENE

Synonyms: Benzene isopropyl, Isopropyl benzene, 2- Phenylpropane

LA DEQ Regulatory Classification: Class 3

CAS Registry Number: 98828

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### PHYSICAL PROPERTIES:

Physical state:	Colorless liquid
Odor:	Ammonia- or amine-like
Boiling point:	152° C at 760mm Hg
Vapor pressure:	460 mm Hg at 20° C
Half-life (clean air)	2.5 days
(poll. air = 1/10)	

### TOXICOLOGICAL PROPERTIES:

Moderately toxic by ingestion. Mildly toxic by inhalation and skin contact. Physical effects upon inhalation or absorption through skin are similar to those of benzene, that is, predominantly narcotic action and CNS depressant. An eye and skin irritant.

ACGIH TLV..... TWA 50 ppm (skin)  
OSHA PEL..... TWA 50 ppm (skin)

### PRINCIPAL SOURCES:

Cumene is used in the manufacture of many organic chemicals such as acetone, phenol, and diisopropylbenzene. It is a component of motor fuel and high octane gasoline, and is found in asphalt and naphtha. It is also used as a catalyst for acrylic and polyester-type resins. Cumene naturally occurs in petroleum crudes and coal tars and is therefore present in petroleum refining and coal tar distillation operations.

### ENVIRONMENTAL FATE:

Cumene is a fairly common air pollutant. Due to its high volatility, much of the cumene released into the environment ends up in the atmosphere, where it can react with NOx to produce ozone. The primary removal mechanism is reaction with photochemically produced hydroxyl radicals. In water, cumene that doesn't volatilize will slowly biodegrade.

### SELECTED REFERENCES:

## CYANIDE COMPOUNDS

Synonyms: Cyanogen, Cyanogen bromide, Cyanogen chloride,  
Cyanogen fluoride, Cyanopropene, etc.

LA DEQ Regulatory Classification: Not classified

CAS Registry Number: 57125

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### PHYSICAL PROPERTIES:

Physical state:	Varies, usually solid
Odor:	n/a
Boiling point:	n/a
Vapor pressure:	n/a
Half-life (clean air) (poll. air = 1/10)	n/a

### TOXICOLOGICAL PROPERTIES:

Very poisonous by most routes. Cyanide directly stimulates the chemoreceptors of the carotid and aortic bodies with a resultant hyperpnea (increase in the depth and rate of respiration). Cardiac irregularities are often noted, but death is due to respiratory arrest of central origin. It can occur within seconds or minutes of the inhalation of high concentrations of HCN gas. Because of slower absorption, death may be more delayed after the ingestion of cyanide salts, but the critical events still occur within the first hour. Clinically, cyanide poisoning is reported to produce a bitter, almond odor on the breath of the patient. Typically, cyanide has a bitter, burning taste, and following poisoning, symptoms of salivation, nausea without vomiting, anxiety, confusion, vertigo, convulsions, paralysis, coma, cardiac arrhythmias, and transient respiratory stimulation followed by respiratory failure occur.

The non-volatile cyanide salts appear to be relatively non-toxic systemically, so long as they are not ingested and care is taken to prevent the formation of HCN. Workers, such as electroplaters and picklers who are daily exposed to cyanid solutions may develop a "cyanide" rash, characterized by itching, and by macular, papular, and vesicular eruptions. Exposure to small amounts of cyanid compounds over long periods of time is reported to cause loss of appetite, headache, weakness, nausea, dizziness, and symptoms of irritation of the upper respiratory tract and eyes.

ACGIH TLV... TWA 5 mg(CN)/m<sup>3</sup>  
OSHA PEL... TWA 5 mg(CN)/m<sup>3</sup>



## DIAMINOTOLUENE

(mixed isomers)

Synonyms: Toluenediamine, ar-Methylbenzenediamine, Methylphenylenediamine

LA DEQ Regulatory Classification: Class 2

CAS Registry Number: 25376458

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### PHYSICAL PROPERTIES:

Physical state:	Colorless crystals
Odor:	n/a
Melting point:	99° C
Vapor pressure:	1 mm Hg at 106.5° C
Half-life (clean air) (poll. air = 1/10)	n/a

### TOXICOLOGICAL PROPERTIES:

Poisonous by ingestion; a skin irritant which can cause blistering after contact. Animal studies indicate that diaminotoluene can cause cancer and is a mutagen. This material has a toxic action on the liver and can cause fatty degeneration of that organ.

IARC Classification... AP  
EPA Classification..... B2

### PRINCIPAL SOURCES:

Diaminotoluene is used primarily as a chemical intermediate in the synthesis of organic chemicals such as toluene diisocyanate. It is also used in the production and application of some dyes.

### ENVIRONMENTAL FATE:

Information not available.

### SELECTED REFERENCES:

2, 8

## 1,2-DIBROMOETHANE

Synonyms: 1,2-Ethylene dibromide, DBE,  $\alpha$ ,  $\beta$ -Dibromoethane, Dowfume EDB, Ethylene dibromide, EDB, Glycol dibromide, Soilbrom-40, Soilfume

LA DEQ Regulatory Classification: Class 1

CAS Registry Number: 106934

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### PHYSICAL PROPERTIES:

Physical state:	Colorless, heavy liquid
Odor:	Sweet
Boiling point:	131.4° C at 760mm Hg
Vapor pressure:	17.4 mm Hg at 25° C
Half-life (clean air) (poll. air = 1/10)	112.3 days

### TOXICOLOGICAL PROPERTIES:

Can be absorbed into the body through inhalation and dermal contact. Exposure can irritate the eyes, nose, and throat. Higher levels can irritate or burn lungs, causing pulmonary edema. High level exposure can cause dizziness, drowsiness, vomiting, unconsciousness, and death. It may also damage the liver and kidneys. 1,2-Dibromoethane is a known carcinogen and teratogen, causing damage to reproductive organs and developing fetuses. Workers exposed to EDB are warned to avoid disulfiram due to dangerous synergistic interactions between the two chemicals.

NTP Classification..... CS  
IARC Classification... 2A  
EPA Classification..... B2  
EPA HEEP Listing..... Devel., Repro., and Chronic  
OSHA PEL..... TWA 20 ppm; CL 30 ppm

### PRINCIPAL SOURCES:

EDB is used as a grain fumigant, general solvent, in the synthesis of other organic chemicals, in waterproofing preparations, in insecticides, and in the manufacture of pharmaceuticals. It is also found in leaded gasoline and in emissions from combustion of leaded gasoline. Elevated levels of EDB (0.05-0.5  $\mu\text{g}/\text{cu m}$ ) are found near gas stations, in urban air, near gasoline bulk loading terminals, and near agricultural fumigating centers.

### ENVIRONMENTAL FATE:

In water EDB hydrolyzes to ethylene glycol and bromoethanol (half-life is 5-10 days). These chemicals are then slowly degraded to less complex chemicals. In soil, EDB is converted to ethylene gas which may escape into the atmosphere.

## DIBUTYL PHTHALATE

Synonyms: n- Butyl phthalate, Benzene-o-dicarboxylic acid (dibutyl ester), DBP, Celluflex PBP, Eloal, Polycizer DBP, PX 104, Stayflex DBP

LA DEQ Regulatory Classification: Class 2

CAS Registry Number: 84742

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### PHYSICAL PROPERTIES:

Physical state:	Colorless, oily liquid
Odor:	Mild
Boiling point:	340° C at 760mm Hg
Vapor pressure:	<0.01 mm Hg at 20° C
Half-life (clean air) (poll. air = 1/10)	18 hours

### TOXICOLOGICAL PROPERTIES:

Contact with liquid can irritate the skin and eyes. Exposure to the vapor or aerosol can irritate the eyes, nose, mouth, and lungs. Chronic effects from repeated exposures include damage to developing fetuses and possible damage to male reproductive organs.

ACGIH TLV..... TLV 5 mg/ m<sup>3</sup>  
OSHA PEL..... TLV 5 mg/ m<sup>3</sup>

### PRINCIPAL SOURCES:

Dibutyl phthalate (DBT) is a ubiquitous pollutant due to its widespread use primarily as a plasticizer in plastics which are used throughout society. Primary uses for dibutyl phthalate are in the manufacture of flexible plastic, as a lacquer solvent, and as an insect repellent.

### ENVIRONMENTAL FATE:

DBT may be released into the environment as emissions and in wastewater during its production and use, from incineration of plastics, and migration of the plasticizer from materials containing it. If released into water, it will adsorb moderately to sediments and particulates in the water column. The DBT will disappear in 3-5 days in moderately polluted waters and generally within 3 weeks in cleaner bodies of water. It will not bioconcentrate in fish since it is readily metabolized. If spilled on land, it will adsorb moderately to soil and slowly biodegrade. DBT is found in groundwater in rapid infiltration sites and elsewhere. It has been suggested that its tendency to form complexes with water-soluble fulvic acids, a component of soils, may aid its transport into ground water. If released into air, DBT is subject to settling out, due to its

## 1,4-DICHLOROBENZENE

Synonyms: p-Dichlorobenzene, p-Chlorophenyl chloride, p-Dichlorobenzol,  
NCI-C54955, Paracide, ParaDow, PDB, PDBC, Paramoth

LA DEQ Regulatory Classification: Class 2

CAS Registry Number: 106467

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### PHYSICAL PROPERTIES:

Physical state:	White or colorless solid
Odor:	Aromatic, penetrating
Boiling point:	174° C at 760mm Hg
Vapor pressure:	1.18 mm Hg at 25° C
Half-life (clean air) (poll. air = 1/10)	3 days

Note: Soluble in alcohols and liquid hydrocarbons. Sublimates at room temperature.

### TOXICOLOGICAL PROPERTIES:

1,4-Dichlorobenzene (p-DCB) can be absorbed into the body through ingestion, inhalation, and dermal contact, but is readily excretable. The persons most likely to be exposed are those who work directly in its manufacture or processing, those who live in the vicinity of any industrial area where it is produced, and some who use it. Exposure can cause headaches, dizziness, nausea, and swelling around the eyes, hands, or feet. Contact with the dust can cause skin burns, and exposure to the vapor can irritate the eyes nose, and throat. Exposure to high concentrations can cause severe liver damage. Long-term effects can include damage to the nervous system, skin allergy, and damage to the lungs, liver, kidneys, and blood cells. An experimental carcinogen, mutagen, and teratogen in animals; suspected human carcinogen.

IARC Classification...	2B
EPA Classification.....	B2
HEEP Listing.....	Devel., Repro., Chronic, Neuro., Aquatic
ACGIH TLV.....	TWA 75 ppm; STEL 110 ppm
OSHA PEL.....	TWA 75 ppm

### PRINCIPAL SOURCES:

The major uses of p-DCB are as space deodorizers (primarily in bathrooms), moth repellents (moth balls), and as an intermediate on the production of polyphenylene sulfide (PPS) resins. Approximately 95% of the environmental releases of p-DCB occur during its use. Relatively small amounts of p-DCB are disposed of in landfills from production processes. In 1984, almost 30 million lb of p-DCB was used in the U.S.

## 1,2-DICHLOROETHANE

Synonyms: 1,2-DCE, Dichloremulsion, dichloroethylene, Ethylene dichloride, EDC, Ethylene chloride, NCI-C00511

LA DEQ Regulatory Classification: Class 2

CAS Registry Number: 107062

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### PHYSICAL PROPERTIES:

Physical state:	Colorless liquid
Odor:	Sweet, pleasant
Boiling point:	83° C at 760mm Hg
Vapor pressure:	61 mm Hg at 20° C
Half-life (clean air)	127.6 days
(poll. air = 1/10)	

### TOXICOLOGICAL PROPERTIES:

Humans are exposed to 1,2-dichloroethane primarily by inhalation of vapors or ingestion of contaminated drinking water. 1,2-Dichloroethane may be present in air around industrial sites or in the home as a result of vaporization from pesticides, glued wallpaper or carpet, and pesticides. While there is little data on acute effects from exposure to 1,2-dichloroethane, chronic exposure may result in cancer of the liver, lung, or kidneys, and heart, lung, or nervous disorders. An established animal carcinogen, probable human carcinogen.

IARC Classification...	2B
EPA Classification.....	B2
HEEP Listing.....	Devel., Repro., Chronic
ACGIH TLV.....	TWA 10 ppm
OSHA PEL.....	TWA 50 ppm; CL 100 ppm
NIOSH REL.....	TWA 1 ppm; CL 2 ppm/15 min.

### PRINCIPAL SOURCES:

Currently, there are 10 domestic manufacturers of 1,2-dichloroethane in the U.S. (nine of fifteen sites are in Louisiana), producing a combined total of 17.44 billion lbs in 1987. Approximately 84% of the U.S. production is for the manufacture of vinyl chloride. Other chemicals produced from 1,2-dichloroethane include vinylidene chloride, 1,1,1-trichloroethane, tri-, tetra-, and perchloroethylene. In addition to these synthetic uses, 1,2-dichloroethane is found in wetting and penetrating agents, fumigants, varnish and finish removers, in solvents, paints, coatings, and adhesives. Releases of the compound to the environment result from the industrial processes involved in the manufacture, use, storage, distribution, and disposal of the compound as a commercial chemical, including use of the compound in consumer goods.

## DICHLOROMETHANE

Synonyms: DCM, Methylene chloride, Methane dichloride, Methylene bichloride

LA DEQ Regulatory Classification: Class 2

CAS Registry Number: 75092

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### PHYSICAL PROPERTIES:

Physical state:	Colorless, volatile liquid
Odor:	Sweetish
Boiling point:	39.8° C at 760mm Hg
Vapor pressure:	349 mm Hg at 20° C
Lifetime in atmosphere:	.5 to 1.3 years

### TOXICOLOGICAL PROPERTIES:

Dichloromethane (DCM) is a volatile liquid with high lipid solubility. It is absorbed primarily by inhalation and ingestion. Although absorption through the skin may occur, this process is slow. Due to its high lipid solubility and modest water solubility, absorption of DCM following exposure is rapid, with distribution to a wide range of tissues and body fluids quickly following. Acute exposure to DCM has been associated with impairment in function of the central nervous system, and liver and kidney effects. Chronic exposure has been associated with mild liver toxicity. Statistical increases in the formation of nodules and carcinomas in mice and rats exposed to DCM have been found, although these results have not been seen in humans.

IARC Classification...	2B
EPA Classification.....	B2
ACGIH TLV.....	TWA 50 ppm
OSHA PEL.....	TWA 500 ppm; CL 1000 ppm

### PRINCIPAL SOURCES:

Dichloromethane is produced in the U.S. by methane chlorination, or the chlorination of methyl chloride. There were four major producers of DCM in the U.S. in 1983, with production of 265,000 Mg (162,500 Mg were produced in Louisiana in 1987). The major uses of DCM in the U.S. include its use as a paint remover and solvent, as a flammability depressant in aerosol products, in the manufacture of synthetic fibers, photographic films, textiles, and pharmaceuticals, in plastics processing, as a refrigerant, in organic synthesis, and as a blowing agent in foams. DCM also has numerous other uses.

## 1,2-DICHLOROPROPANE

Synonyms: Propylene chloride, Propylene dichloride, NCI-55141

LA DEQ Regulatory Classification: Class 2

CAS Registry Number: 78875

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### PHYSICAL PROPERTIES:

Physical state:	Colorless liquid
Odor:	Chloroform-like
Boiling point:	96.37° C at 760mm Hg
Vapor pressure:	49.67 mm Hg at 25° C
Half-life (clean air) (poll. air = 1/10)	>23 days

### TOXICOLOGICAL PROPERTIES:

Can be absorbed into the body through ingestion, inhalation, and dermal contact, but is readily excretable. Acute effects from drinking or breathing concentrated amounts include dizziness, headaches, nausea, injury to liver and kidneys, anemia, coma, or death. Short-term exposure produces irritation to the eyes or throat. Chronic exposure to low levels produces damage to the liver, kidneys, and respiratory system. The greatest risk of exposure are to those who obtain drinking water from private wells in areas where 1,2-dichloropropane was once used as a soil fumigant, to industrial workers where it is manufactured or used, and to workers involved in remediation at hazardous waste or spill sites. 1,2-dichloropropane has been shown to produce birth defects in animals and in humans. Animal studies indicate that it may be carcinogenic.

IARC Classification...3  
ACGIH TLV..... TWA 75 ppm; STEL 110 ppm  
OSHA PEL..... TWA 75 ppm

### PRINCIPAL SOURCES:

1,2-dichloropropane is produced exclusively by Dow Chemical, where approximately 95% is used on-site as a captive chemical intermediate in the production of perchloroethylene and other chlorinated products. Most other uses for 1,2-dichloropropane have been phased out in favor of more effective or inexpensive compounds.

### ENVIRONMENTAL FATE:

Estimated environmental releases to the air in 1986 totalled 772,00 lbs. This included process emissions, volatilization of wastewater treatment, emissions due to incomplete combustion, and land disposal residues, but does not include fugitive emissions. The dominant removal process from surface water is volatilization, which puts it into the atmosphere. The primary mode of

## 1,3-DICHLOROPROPYLENE

Synonyms: 1,3-Dichloro-1-propene,  $\gamma$ -Chloroallyl chloride, 1,3-Dichloropropene, NCI-C03985, Telone II soil fumigant, Vidden D

LA DEQ Regulatory Classification: Class 2

CAS Registry Number: 542756

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### PHYSICAL PROPERTIES:

Physical state:	Straw-colored liquid
Odor:	Sharp, sweet, irritating
Boiling point:	103° C at 760mm Hg
Vapor pressure:	28 mm Hg at 25° C
Half-life (clean air) (poll. air = 1/10)	n/a

### TOXICOLOGICAL PROPERTIES:

Exposure most likely through inhalation or dermal contact. Exposure can cause dizziness, headache, chest pain, and with higher levels, loss of consciousness. Contact can cause severe eye burns, with permanent damage, or severe burns of the skin. Inhalation will irritate the nose and throat. Higher levels can irritate the lungs, causing coughing and shortness of breath. 1,3-Dichloropropylene is a probable human carcinogen and may cause cancer of the liver, lung, and stomach. Repeated exposure can damage these organs as well.

IARC Classification... 2B  
EPA Classification..... B2  
EPA HEEP Listing..... Acute, Chronic, Aquatic  
ACGIH TLV..... 1 ppm (skin)

### PRINCIPAL SOURCES:

1,3-Dichloropropylene is primarily used as a soil fumigant.

### ENVIRONMENTAL FATE:

1,3-dichloropropylene released into the environment will primarily volatilize into the atmosphere where its fate is unknown.

### SELECTED REFERENCES:

2, 5



## 2,4-DINITROTOLUENE 2,6-DINITROTOLUENE

Synonyms: DNT, 2,4-DNT, 1-Methyl-2,4-dinitrotoluene, NCI-C01865  
2,6-DNT, 2-Methyl-1,3-dinitrobenzene

LA DEQ Regulatory Classification: Class 2

CAS Registry Number: 121142, 606202, respectively

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### PHYSICAL PROPERTIES:

Physical state:	Yellow, crystalline solid
Odor:	n/a
Melting point:	69.5° C
Vapor pressure:	n/a
Half-life (clean air)	n/a
(poll. air = 1:10,	

### TOXICOLOGICAL PROPERTIES:

2,4- and 2,6-Dinitrotoluene (DNT) may be absorbed through the skin, inhaled, or ingested. The primary risk of exposure are to workers in facilities which manufacture, transport, or use the chemical. Contact with molten DNT or hot fumes can cause severe skin and eye burns, with possible permanent damage. Exposure can interfere with the ability of the blood to carry oxygen. This can cause symptoms of weakness, dizziness, headaches, and blue coloration of the lips and nose. Higher exposures can cause nausea, vomiting, shortness of breath, rapid or irregular heartbeat, unconsciousness, and death. DNT may be a carcinogen in humans, and chronic exposure can damage the liver and result in a low blood count.

EPA Classification... B2, C, respectively  
EPA HEEP Profile..... Repro., Chronic, Neuro.  
ACGIH TLV..... TWA 1.5 mg/m<sup>3</sup> (skin)  
OSHA PEL..... TWA 1.5 mg/m<sup>3</sup> (skin)

### PRINCIPAL SOURCES:

The predominant use of 2,4-DNT and 2,6-DNT is as intermediates in the manufacture of polyurethanes, which account for 99% of its production. It is also used in the production of explosives. DNT may enter the environment through the release of wastewater from processing, or as dusts, aerosols, and other suspended particles. Particulates are of most concern to workers at polyurethane plants. Non-occupationally-exposed individuals would be more likely to ingest DNT via contaminated drinking water and food.

## 1,4-DIOXANE

Synonyms: Diethylene dioxide, Diethylene ether, 1,4-Dioxacyclohexane, p-Dioxane, Dioxane, Glycol ethylene ether, Tetrahydro-1,4-dioxin

LA DEQ Regulatory Classification: Class 2

CAS Registry Number: 123911

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### PHYSICAL PROPERTIES:

Physical state:	Colorless liquid
Odor:	Pleasant
Boiling point:	101.1° C
Vapor pressure:	40 mm Hg at 25° C
Half-life (clean air) (poll. air = 1/10)	n/a

### TOXICOLOGICAL PROPERTIES:

Human exposure may occur through inhalation or ingestion; absorption through the skin is low. In acute exposures, the signs and symptoms consist of irritation of the eyes and naso-pharynx, which may later subside, to be followed by headache, drowsiness, dizziness, and occasionally nausea and vomiting. In chronic exposures, there may be loss of appetite, nausea and vomiting, pain and tenderness in the abdomen and lumbar region, malaise, and enlargement of the liver without jaundice. Further exposure may result in suppression of urine, followed by uremia and death. An experimental carcinogen, neoplastin, teratogen, and tumorigen.

NTP Classification.....	CS
IARC Classification...	2B
EPA Classification.....	B2
ACGIH TLV.....	TWA 25 ppm (skin)
OSHA PEL.....	TWA 100 ppm (skin)

### PRINCIPAL SOURCES:

1,4-Dioxane is used as a solvent for cellulose and a wide range of organic products. It is used as a solvent in paints, lacquers and varnishes, in paint and varnish removers, cleaning and detergent preparations, cements, cosmetics, deodorants, and fumigants.

### ENVIRONMENTAL FATE:

1,4-Dioxane does not biodegrade appreciably; due to its relatively high vapor pressure it is presumed to volatilize into the atmosphere where its fate is uncertain.

## EPICHLOROHYDRIN

Synonyms: 1-Chloro-2,3-epoxypropane, Chloromethyloxirane, Chloropropylene oxide, 2,3-Epoxypropyl chloride, Glycerol epichlorohydrine

LA DEQ Regulatory Classification: Class 1

CAS Registry Number: 106898

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### PHYSICAL PROPERTIES:

Physical state:	Colorless liquid
Odor:	Irritating, chloroform-like
Boiling point:	117.9° C
Vapor pressure:	10 mm Hg at 25° C
Half-life (clean air) (poll. air = 1/10)	4 days

### TOXICOLOGICAL PROPERTIES:

Epichlorohydrin is on the Special Health Hazard Substance List because it is a carcinogen, a mutagen, and is reactive. It can be inhaled or absorbed through the skin. Eye contact with the liquid can cause severe irritation or burns with possible permanent damage. Skin contact with the liquid can cause blistering and severe pain which may be delayed for minutes or hours after contact. The vapor is highly irritating to the eyes, nose, throat, bronchial tubes and lungs. Higher exposures could cause chemical burning of the lungs resulting in pneumonitis or pulmonary edema. Long-term exposure can cause allergies, decreased fertility, organ damage, and cancer.

IARC Classification... 2A  
EPA Classification..... E2  
EPA HEA Doc..... Repro., Acute, Chronic, Neuro.  
ACGIH TLV..... TWA 2 ppm (skin)  
OSHA PEL..... TWA 5 ppm (skin)

### PRINCIPAL SOURCES:

Epichlorohydrin may be released to the atmosphere and in wastewater during its production and use in epoxy resins, glycerin manufacture, as a chemical intermediate in the manufacture of other chemicals, and in other uses.

### ENVIRONMENTAL FATE:

If released into water, epichlorohydrin will be lost primarily by evaporation and hydrolysis. It should neither adsorb appreciably to sediment nor bioconcentrate in fish. In the atmosphere, epichlorohydrin will degrade by reaction with photochemically produced hydroxyl radicals. It is somewhat soluble in water and will therefore be subject to washout by rain.

## ETHYL ACRYLATE

Synonyms: Acrylic acid ethyl ester, Ethyl propenoate, NCI-C50384,  
2-Propenoic acid (ethyl ester)

LA DEQ Regulatory Classification: Class 2

CAS Registry Number: 140885

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### PHYSICAL PROPERTIES:

Physical state:	Colorless liquid
Odor:	Acrid, penetrating
Boiling point:	99.8° C
Vapor pressure:	29.5 mm Hg at 20° C
Half-life (clean air) (poll. air = 1/10)	n/a

### TOXICOLOGICAL PROPERTIES:

Most likely exposure is by absorption through skin or inhalation. Contact with liquid can cause burning, rash, or irritation of the skin and damage to the eyes. Breathing the vapor may irritate the nose, throat, and lungs, causing coughing or shortness of breath. Higher exposure can cause pulmonary edema. Exposure to high concentrations can quickly cause dizziness, difficulty breathing, unconsciousness and death. Repeated exposure to ethyl acrylate can cause drying and cracking of the skin and damage to the lining of the nose. Ethyl acrylate has been shown to cause cancer in laboratory animal tests.

IARC Classification...	2B
EPA HEEP Listing.....	Chronic, Aquatic
ACGIH TLV.....	TWA 5 ppm, STEL 15 ppm (skin)
OSHA PEL.....	TWA 25 ppm (skin)

### PRINCIPAL SOURCES:

Ethyl acrylate is primarily used in the making of acrylic resins, plastics, rubber, and denture materials.

### ENVIRONMENTAL FATE:

Biodegradation is a removal mechanism for ethyl acrylate released to water, but volatilization should be significant as well. Fate of ethyl acrylate in air is not documented.

### SELECTED REFERENCES:

2, 5, 7

# ETHYL BENZENE

Synonyms: EB, Ethylbenzpol, NCI-C56393, Phenylethane

LA DEQ Regulatory Classification: Class 2

CAS Registry Number: 100414

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## PHYSICAL PROPERTIES:

Physical state:	Colorless liquid
Odor:	Aromatic
Boiling point:	136.2° C
Vapor pressure:	7.1 mm Hg at 20° C
Half-life (clean air) (poll. air = 1/10)	2 days

## TOXICOLOGICAL PROPERTIES:

Most likely route of exposure is by absorption through skin or inhalation. Contact with liquid can cause irritation of skin or eyes. Breathing vapor may irritate the nose, throat, and lungs, causing coughing or shortness of breath. Exposure to high concentrations can cause you to become dizzy, lightheaded, or to pass out. Chronic exposure effects have not been well documented, but similar petroleum based chemicals are documented to cause damage to the brain, liver, neurological tissues, and other organs.

EPA HEA Doc... Devel., Chronic  
ACGIH TLV..... TWA 100 ppm (skin)  
OSHA PEL..... TWA 100 ppm (skin); STEL 125 ppm

## PRINCIPAL SOURCES:

Ethyl benzene is used in the production of styrene and synthetic polymers, as a solvent, and as a component of automotive and aviation fuels. Releases to the environment include emissions, wastewater, leaks, and spills connected with its production, its use in the manufacture of styrene, and use as a solvent. Other sources that have been mentioned include emissions from petroleum refining, vaporization losses and spills of gasoline and diesel fuel at filling stations and during storage and transit of these fuels, auto emissions, and cigarette smoke.

## ENVIRONMENTAL FATE:

When released onto soil, ethylbenzene will both volatilize into the atmosphere and leach into ground water. There is evidence that ethylbenzene will slowly biodegrade, but there are cases where it has remained in large concentrations in ground water for over a year after a spill. In surface waters, the bulk of the chemical will volatilize, although it is capable of being degraded fairly rapidly by

## ETHYLENE GLYCOL

Synonyms: 1,2-Dihydroxyethane, 1,2-Ethanediol, Ethylene alcohol, Glycol,  
Monoethylene glycol

LA DEQ Regulatory Classification: Class 3

CAS Registry Number: 107211

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### PHYSICAL PROPERTIES:

Physical state:	Colorless, heavy liquid
Odor:	None
Boiling point:	197.5° C
Vapor pressure:	0.05 mm Hg at 20° C
Half-life (clean air) (poll. air = 1/10)	n/a

### TOXICOLOGICAL PROPERTIES:

Ethylene glycol may be inhaled, ingested, or absorbed through the skin. Exposure can cause an intoxicated feeling, with nausea, vomiting, and headache. Higher exposures can cause kidney damage and death. It can irritate the eyes, nose, and throat. Chronic exposure may result in a persistent skin rash or allergy. It may also affect the kidney and brain. Ethylene glycol has been shown to be teratogenic in animal studies and is believed to cause damage to the developing fetus.

ACGIH TLV... TWA 50 ppm (vapor)

### PRINCIPAL SOURCES:

Ethylene glycol is widely used as a coolant and anti-freeze agent in automobiles, trucks, and machinery. It is used as a component in asphalt emulsion paints, brake fluid, and de-icing fluids. It is also used in the manufacture of polyester fibers and films, and as a solvent. Other than emissions from manufacturing and industries which use ethylene glycol, a primary source of environmental release is from the draining and flushing of radiators in automobiles and machinery.

### ENVIRONMENTAL FATE:

Ethylene glycol released into the air will likely be washed out into water. In water or in moist soils, it would be expected to slowly biodegrade.

### SELECTED REFERENCES:

2, 5, 7

## ETHYLENE OXIDE

Synonyms: Amprolene, Dimethylene oxide, E.O., Epoxyethane, Ethene oxide, Oxane

LA DEQ Regulatory Classification: Class 1

CAS Registry Number: 78875

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### PHYSICAL PROPERTIES:

Physical state:	Colorless gas
Odor:	n/a
Boiling point:	10.7° C at 760mm Hg
Vapor pressure:	1095 mm Hg at 20° C
Half-life (clean air) (poll. air = 1/10)	401.1 days

### TOXICOLOGICAL PROPERTIES:

Powerful irritant, can be absorbed through inhalation, oral uptake, or through skin contact. Acute exposure produces irritation of the eyes, mucous membranes, and lungs, and can cause pulmonary edema. Experiments on animals indicate that ethylene oxide can produce harmful reproductive effects.

NTP Classification..... CS  
IARC Classification... 2A  
EPA Classification..... B1  
EPA HEA Doc..... Devel., Repro., Acute, Chron., Neuro.  
ACGIH TLV ..... TWA 1 ppm  
OSHA PEL..... TWA 1 ppm

### PRINCIPAL SOURCES:

Ethylene oxide enters the atmosphere primarily in association with its production and use as a chemical intermediate, as well as its relatively minor use as a sterilant and fumigant. It is also a product of combustion of hydrocarbon fuels. Ethylene oxide is used as a chemical intermediate in the production of ethylene glycol, ethoxylates, glycol ethers, and ethanolamines. In these processes ethylene oxide is released from vents, as fugitive emissions, and into the water.

### ENVIRONMENTAL FATE:

Ethylene oxide will degrade in the atmosphere primarily by reaction with hydroxyl radicals and water vapor. However, due to its long half-life in air, long-range transport and wash out in rainfall are possible. In water, ethylene oxide will be lost primarily through volatilization, hydrolysis, and biodegradation. Ethylene oxide hydrolyzes to ethylene glycol in fresh water and ethylene

## FORMALDEHYDE

Synonyms: Formalin, Formic aldehyde, FA, Formal, Methanal, Methylene glycol, NCI-C02799, Oxymethylene, Paraform, Polyoxymethylene glycols

LA DEQ Regulatory Classification: Class 1

CAS Registry Number: 50000

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### PHYSICAL PROPERTIES:

Physical state:	Clear or white solution
Odor:	Pungent, irritating
Boiling point:	varies with solvent
Vapor pressure:	3883 mm Hg at 25° C
Half-life (clean air)	3.1 days
(poll. air = 1/10)	

### TOXICOLOGICAL PROPERTIES:

Usually enters the body through inhalation or dermal contact. Ingestion causes immediate and violent effects. Acute exposure causes eye, nose, and throat irritation, and can cause skin and lung allergy. Higher levels can cause throat spasm and a build-up of fluid in the lungs. Contact may cause severe burns of the eyes or skin which may not appear until hours after exposure, and may result in permanent scarring. Chronic exposure to formaldehyde can cause cancer, allergies, asthma and bronchitis.

NTP Class.....	CS
IARC Classification...	2A
EPA Classification....	B1
ACGIH TLV.....	TWA 1 ppm
OSHA PEL.....	TWA 1 ppm

### PRINCIPAL SOURCES:

Formaldehyde is produced in large quantities (5.7 billion lbs in 1983) primarily for use in the manufacture of resins and as a chemical intermediate. Other man-made sources of formaldehyde include its use as a fumigant, in leather tanning, in resins for plywood and particleboard production, as a tissue preservative and as embalming fluid. Most of the formaldehyde entering the environment is produced directly or indirectly in combustion processes. In addition, formaldehyde is produced by natural sources such as fires, animal wastes, microbial by-products and plant volatiles.

### ENVIRONMENTAL FATE:

Formaldehyde is released to the atmosphere in large amounts and formed in the atmosphere by photooxidation of hydrocarbons. This input is counterbalanced by photolysis, reaction with hydroxyl free radicals during



## GLYCOL ETHERS

(Mixed isomers)

Synonyms: Diethylene glycol methyl ether, Diglycol monomethyl ether, MECB, Dowanol DM, Methoxydiglycol, Methyl carbitol, Poly-solv DM

LA DEQ Regulatory Classification: Class 2

CAS Registry Number: 111773 (Diethylene glycol monomethyl ether)

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### PHYSICAL PROPERTIES:

Physical state:	Clear to whitish liquid
Odor:	Mild, sweet, musty
Boiling point:	194.2° C
Vapor pressure:	0.25 mm Hg at 25° C
Half-life (clean air)	n/a
(poll. air = 1/10)	

### TOXICOLOGICAL PROPERTIES:

Human exposure may occur through ingestion, inhalation, or dermal contact. Acute toxic effects include irritation of the eyes, nose, and throat; drowsiness, weakness, and shaking. Ingestion may be fatal. Prolonged or repeated exposure may cause drowsiness, weakness, headache, fatigue, staggering, personality changes, and mental dullness. Exposed workers have suffered degenerative brain disease, bone marrow depression, and depressed levels of blood cells. Some isomers of glycol ethers cause adverse reproductive effects in males and females. Animal studies indicate that exposure of pregnant females to below-OSHA permissible levels of glycol ethers can cause increased embryonic death, teratogenesis, or growth retardation of the infants.

EPA HEA Doc. - Devel., Repro., Chronic

### PRINCIPAL SOURCES:

Glycol ethers are used in the manufacture of organic chemicals, as a solvent for dyes, as a solvent in mineral oil-soaps, in nonaqueous stains for wood, in textile manufacture, lacquers, and as brake fluid diluent.

### ENVIRONMENTAL FATE:

Information not available.

### SELECTED REFERENCES:

2, 7

## HEXACHLORO-1,3-BUTADIENE

Synonyms: Perchlorobutadiene, HCBd, Hexachlorobutadiene,  
1,1,2,3,4,4-Hexachloro-1,3-butadiene

LA DEQ Regulatory Classification: Class 2

CAS Registry Number: 87683

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### PHYSICAL PROPERTIES:

Physical state:	Clear liquid
Odor:	Faint turpentine
Boiling point:	215° C
Vapor pressure:	0.15 mm Hg at 25° C
Half-life (clean air) (poll. air = 1/10)	1-12 months

### TOXICOLOGICAL PROPERTIES:

May be ingested, inhaled, or absorbed through the skin. Contact with liquid can burn the skin and eyes. Exposure to high levels can damage the kidneys and liver. Hexachlorobutadiene (HCBd) has been shown to cause kidney cancer in animals and may damage a developing fetus if exposure occurs during pregnancy.

IARC Classification... 3  
EPA Classification.... C  
ACGIH TLV..... TWA 0.02 ppm (skin)

### PRINCIPAL SOURCES:

HCBd is used as a solvent for elastomers, a heat transfer liquid, as a transformer and hydraulic fluid, and for recovery of chlorine-containing gas in chlorine producing plants. High concentrations of HCBd are associated with the production of perchloroethylene and trichloroethylene.

### ENVIRONMENTAL FATE:

If released onto the ground, evaporation is expected to account for significant removal from the soil. Adsorption to soil particles and biota will also occur. In water HCBd will degrade aerobically (half-life 3-30 days in river water), but some will adsorb to suspended sediment and will bioconcentrate in aquatic organisms. Volatilization will also occur from water. In the atmosphere, HCBd should degrade primarily through interaction with photochemically generated hydroxyl radicals, but the process is very slow, resulting in wide dispersion and build-up in the troposphere. HCBd is found in remote areas of the globe far removed from emission sources. Mississippi River water near Baton Rouge has

## HEXACHLOROBENZENE

Synonyms: HCB, Pentachlorophenyl chloride, Perchlorobenzene, Phenyl perchloryl, Sanocide, Bunt-cure

LA DEQ Regulatory Classification: Class 2

CAS Registry Number: 118741

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### PHYSICAL PROPERTIES:

Physical state:	White needles
Odor:	n/a
Boiling point:	323-326° C
Vapor pressure:	n/a
Half-life (clean air) (poll. air = 1/10)	2 years

### TOXICOLOGICAL PROPERTIES:

Hexachlorobenzene can affect you when breathed in and by passing through the skin. Contact can cause eye or skin irritation and rash. Breathing hexachlorobenzene can cause irritation of the nose, throat, and lungs. High or repeated exposure may damage the liver, immune system, thyroid, kidneys, and nervous system. Hexachlorobenzene may be a carcinogen in humans since it has been shown to cause liver and thyroid cancer in animals. It may also damage the developing fetus. HCB is a toxicological and environmental concern because of its bioaccumulation and persistence. EPA's monitoring of human adipose tissue collected across the U.S. shows trace residues of HCB in about 95% of the population.

NTP Classification..... CS  
EPA HEA Doc..... Devel., Repro., Chronic, Neuro., Aquatic  
IARC Classification... 2B  
EPA Classification..... B2

### PRINCIPAL SOURCES:

HCB is a pesticide, an industrial chemical, and a by-product from many chemical and pesticide manufacturing processes. In the United States, HCB is used mainly as a fungicide to control wheat bunt and smut fungi on other grains. It is also a chemical intermediate in dye manufacture and in the synthesis of other organic chemicals, and is used as a wood preservative. HCB forms as an impurity during the synthesis of several herbicides and pesticides. HCB is spread into the environment due to emissions from manufacturers and those using the chemical, by the transporting of pesticides and chemical wastes, through the use of preserved building products, and through feed grains and pesticide application. It has therefore become ubiquitous in the U.S. environment.

# HEXACHLOROETHANE

Synonyms: 1,1,1,2,2,2-Hexachloroethane, Carbon hexachloride, Phenohep, Ethane hexachloride, Distopan, Perchloroethane

LA DEQ Regulatory Classification: Class 2

CAS Registry Number: 67721

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## PHYSICAL PROPERTIES:

Physical state:	White crystalline solid
Odor:	camphor-like
Melting point:	186.6° C
Vapor pressure:	1 mm. Hg at 25° C
Half-life (clean air)	30 years
(poll. air = 1/10)	

## TOXICOLOGICAL PROPERTIES:

Hexachloroethane can affect you when breathed in and by passing through the skin. Contact can cause eye or skin irritation and burning. Breathing hexachloroethane can cause irritation of the nose, throat, and lungs. Symptoms of high exposure include dizziness, lightheadedness, and unconsciousness. Long-term exposure may cause liver and kidney damage. Hexachloroethane has been shown to cause liver cancer in animals.

IARC Classification...	3
EPA Classification.....	C
ACGIH TLV.....	TWA 1 ppm
OSHA PEL.....	TWA 1 ppm (skin)

## PRINCIPAL SOURCES:

Hexachloroethane has been used as an insecticide, in animal medicines, and in smoke-making devices. It is also formed in minor amounts in many industrial chlorination processes designed to produce lower chlorination products. Other potential sources of hexachloroethane release to the environment include: formation during combustion and incineration of chlorinated wastes; releases to air due to volatility, inefficient solvent recovery and recirculation; and, formation of very small amounts during chlorination of sewage effluent prior to discharge.

## ENVIRONMENTAL FATE:

Hexachloroethane released to land or water is expected to volatilize to the atmosphere. Biodegradation is not expected to account for much removal from the environment. This means that any hexachloroethane trapped in the ground

# HYDRAZINE

Synonyms: Anhydrous hydrazine, Diamine, Hydrazine base

LA DEQ Regulatory Classification: Class 2

CAS Registry Number: 302012

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## PHYSICAL PROPERTIES:

Physical state:	Colorless, oily fuming liquid
Odor:	ammonia smell
Boiling point:	113.5° C
Vapor pressure:	10 mm Hg at 20° C
Half-life (clean air) (poll. air = 1/10)	n/a

## TOXICOLOGICAL PROPERTIES:

Hydrazine can affect you when breathed in and by passing through the skin. Contact with the eye or skin can cause serious burns. Breathing hydrazine produces great irritation of the nose, throat, and lungs, causing coughing and shortness of breath. High or repeated exposure may damage the liver, lungs, and kidneys. Other long-term effects include damage to the nervous system, damage to red blood cells, and a persistent rash. Hydrazine is a probable carcinogen in humans since it has been shown to cause lung and liver cancer, and leukemia in animals.

NTP Classification..... CS  
IARC Classification... 2B  
EPA Classification..... B2  
EPA HEEP Listing..... Chronic, Aquatic  
ACGIH TLV..... TWA 0.1 ppm (skin)  
OSHA PEL..... TWA 1 ppm (skin)

## PRINCIPAL SOURCES:

Hydrazine is used mainly as a chemical intermediate to produce agricultural chemicals, spandex fibers and antioxidants. Hydrazine also is a rocket fuel, oxygen scavenger in water boiler and heating systems, polymerization catalyst, blowing agent, and scavenger for gases. Additionally, it is used for plating metals on glass and plastics, and in fuel cell, and photographic developers. Hydrazine sulfate is used in refining rare metals, as an antioxidant in soldering flux for light metals; in analytical tests for blood, and in the preparation of hydrazine hydrate.

## ENVIRONMENTAL FATE:

Hydrazine in wastewater does not readily biodegrade. Fate in the atmosphere is not documented.

## HYDROCHLORIC ACID

Synonyms: Chlorohydric acid, Hydrochloride, Hydrogen chloride, Muriatic acid

LA DEQ Regulatory Classification: Class 3

CAS Registry Number: 7647010

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### PHYSICAL PROPERTIES:

Physical state:	Colorless, corrosive gas
Odor:	Strong, pungent
Boiling point:	n/a
Vapor pressure:	>1 mm Hg at 20° C
Half-life (clean air) (poll. air = 1/10)	n/a

### TOXICOLOGICAL PROPERTIES:

Hydrochloric acid is a strong corrosive which can cause irritation and damage by any route of exposure. Contact with strong solutions can cause severe skin burns and permanent damage to the eyes. Inhalation of vapors causes irritation of the mouth, nose, and throat. High levels may irritate the lungs, causing coughing and shortness of breath, or pulmonary edema. There is limited evidence that workers who are chronically exposed to hydrochloric acid have an increased incidence of respiratory cancer. Other chronic effects may include erosion of the teeth, skin rash, and lung injury.

ACGIH TLV... CL 5 ppm  
OSHA PEL... CL 5 ppm

### PRINCIPAL SOURCES:

Hydrochloric acid is widely used in the manufacture of other chemicals, in metal processing industries, and as a reagent in analytical chemistry.

### ENVIRONMENTAL FATE:

Hydrochloric acid in the atmosphere contributes to acid rain. In water, dissociated chlorine anions may form salts with sodium and other anions.

### SELECTED REFERENCES:

2, 5

## **HYDROGEN CYANIDE**

Synonyms: Hydrocyanic acid, Aero liquid HCN, Fluohydric acid gas, HCN,  
Hydrofluoric acid gas, Prussic acid

LA DEQ Regulatory Classification: Not classified

CAS Registry Number: 74908

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### **PHYSICAL PROPERTIES:**

Physical state:	Water-white liquid or colorless gas
Odor:	Bitter almond
Boiling point:	25.6° C
Vapor pressure:	400 mm Hg at 9.8° C
Half-life (clean air) (poll. air = 1/10)	n/a

### **TOXICOLOGICAL PROPERTIES:**

Very poisonous by all routes. Cyanide directly stimulates the chemoreceptors of the carotid and aortic bodies with a resultant hyperpnea (increase in the depth and rate of respiration). Cardiac irregularities are often noted, but death is due to respiratory arrest of central origin. HCN and the cyanides are true protoplasmic poisons, combining in the tissues with the enzymes associated with cellular oxidation. They thereby render the oxygen unavailable to the tissues and cause death through asphyxia. It can occur within seconds or minutes of the inhalation of high concentrations of HCN gas. Because of slower absorption, death may be more delayed after the ingestion of cyanide salts, but the critical events still occur within the first hour. Clinically, cyanide poisoning is reported to produce a bitter, almond odor on the breath of the patient. Typically, cyanide has a bitter, burning taste, and following poisoning, symptoms of salivation, nausea without vomiting, anxiety, confusion, vertigo, convulsions, paralysis, coma, cardiac arrhythmias, and transient respiratory stimulation followed by respiratory failure occur.

ACGIH TLV... CL 10 ppm (skin)  
OSHA PEL.... TWA 10 ppm (skin)

### **PRINCIPAL SOURCES:**

HCN is used in the manufacture of acrylonitrile, acrylates, adiponitrile, cyanide salts, dyes, chelates, rodenticides and pesticides.

## HYDROGEN FLUORIDE

Synonyms: Hydrofluoric acid, Hydrofluoride, Anhydrous hydrofluoric acid

Regulatory Classification: Class 2

CAS Registry Number: 7664393

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### PHYSICAL PROPERTIES:

Physical state:	Colorless, fuming corrosive liq. or gas
Odor:	Strong, irritating
Boiling point:	19.54° C at 760 mm Hg
Vapor pressure:	400 mm Hg at 25° C
Half-life (clean air) (poll. air = 1/10)	n/a

### TOXICOLOGICAL PROPERTIES:

Hydrogen fluoride can affect you when breathed in and by passing through your skin. Exposure can irritate the nose, throat, and lungs, causing coughing, shortness of breath, and potentially fatal pulmonary edema. Hydrogen fluoride is a corrosive chemical and contact can severely burn the eyes, causing blindness. Contact can cause severe burns deep beneath the skin, damaging internal tissues. This can occur hours after contact, even if no pain is felt initially. Long-term exposure may damage the kidneys and liver, or cause damage to the lungs, producing bronchitis.

ACGIH TLV... CL 3 ppm (F)  
OSHA PEL.... CL 3 ppm (F)

### PRINCIPAL SOURCES:

Hydrogen fluoride is used in etching glass, as an intermediate in the production of other chemicals, and in the production of gasoline.

### ENVIRONMENTAL FATE:

Information not available.

### SELECTED REFERENCES:

2, 5



# HYDROGEN SULFIDE

Synonyms: Hydrogen sulfuric acid, Sulfur hydride

LA DEQ Regulatory Classification: Class 3

CAS Registry Number: 7783064

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## PHYSICAL PROPERTIES:

Physical state:	Colorless gas
Odor:	Offensive, rotten-egg
Boiling point:	-60.4° C
Vapor pressure:	15,200 mm Hg at 25.5° C
Half-life (clean air) (poll. air = 1/10)	n/a

## TOXICOLOGICAL PROPERTIES:

A human poison by inhalation. A severe irritant to the eyes and mucous membranes. An asphyxiant. Human systemic effects by inhalation include chronic pulmonary edema, coma, and death. Low concentrations of 20-150 ppm cause irritation of the eyes; slightly higher concentrations may cause irritation of the upper respiratory tract, and if exposure is prolonged, pulmonary edema may result. The irritant action has been explained on the basis that  $H_2S$  combines with the alkali present on moist surface tissues to form sodium sulfide, a caustic. Exposures of 800-1000 ppm may be fatal in 30 minutes. Repeated exposures to low concentrations can produce conjunctivitis, photophobia, corneal bullae, tearing, pain and blurred vision. Chronic exposure results in headache, inflammation of the conjunctivae and eyelids, digestive disturbances, weight loss and general debility. A common air contaminant.

ACGIH TLV... TWA 10 ppm; STEL 15 ppm  
OSHA PEL... CI 20 ppm

## PRINCIPAL SOURCES:

Hydrogen sulfide can be produced by the action of dilute sulfuric acid on a sulfide usually iron sulfide or by direct union of hydrogen and sulfur vapor at a definite temperature and pressure. It is also produced as a by-product of petroleum refining. Its uses include the purification of hydrochloric and sulfuric acids, precipitating sulfides of metals, and as a source of sulfur.

## MALEIC ANHYDRIDE

Synonyms: cis-Butenedioic anhydride, 2,5-Dihydrofuran-2,5-dione,  
2,5-Furandione, Maleic acid anhydride, Toxilic anhydride

LA DEQ Regulatory Classification: Class 3

CAS Registry Number: 108316

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### PHYSICAL PROPERTIES:

Physical state:	Colorless crystalline or white solid
Odor:	n/a
Melting point:	53° C
Vapor pressure:	0.00005 Hg at 20° C
Half-life (clean air) (poll. air =1/10)	1.7 hours

### TOXICOLOGICAL PROPERTIES:

Most likely route of human exposure is through inhalation. Contact can cause severe burns of the skin and eyes. Exposure to its dust or vapor may irritate the nose, throat, and lungs. Maleic anhydride may cause a skin or lung allergy to develop, so that even small future exposures can cause itching and skin rash and/or an asthma-like episode.

EPA HEEP..... Acute, Chronic, Aquatic  
ACGIH TLV..... TWA 0.25 ppm  
OSHA PEL..... TWA 0.25 ppm

### PRINCIPAL SOURCES:

Maleic anhydride is used for coating automobile bodies, in the manufacture of other chemicals, and in the manufacture of detergents. Maleic anhydride may be spilled or emitted into the atmosphere during its manufacture, transport, or use in the manufacture of alkyd and polyester resins, surface coatings, agricultural chemicals, copolymers, maleic and fumaric acids, and as an oil additive. Because of its ease of hydrolysis to the acid, it should not appear in wastewater.

### ENVIRONMENTAL FATE:

Maleic anhydride released into the atmosphere will degrade by reaction with ozone and photochemically produced hydroxyl radicals. Maleic acid released to water will quickly convert to maleic acid. Its fate in the soil is unknown, but it would be expected to hydrolyzed in moist soils and volatilize from dry soils.

## **MANGANESE**

(and compounds)

Related compounds: Manganese acetate, Manganese(II) chloride, Manganese dioxide, Manganese(II) fluoride, Manganese(I, II, or III) oxide, Manganese(II) perchlorate, Manganese(II) sulfate, etc.

LA DEQ Regulatory Classification: Class 2

CAS Registry Number: 7439965

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### **PHYSICAL PROPERTIES:**

Physical state:	Reddish-grey or silvery brittle metal
Odor:	n/a
Melting point:	1260° C
Vapor pressure:	n/a
Half-life (clean air) (poll. air = 1/10)	n/a

### **TOXICOLOGICAL PROPERTIES:**

Exposure is primarily through inhalation of fumes or dust. Repeated exposure can cause permanent brain damage. Early symptoms include poor appetite, weakness and sleepiness. Later effects include changes in speech, balance and personality. The later symptoms are identical to Parkinsons disease. Heated manganese can release fumes causing a flu-like illness with chills, fever, and aching. Chest congestion resembling pneumonia can also occur. Damage to the liver and kidney may also result from exposure.

EPA HEA Doc.... Repro.. Acute, Chronic, Neuro  
ACGIH TLV..... TWA 5 mg/m<sup>3</sup> (dust)  
OSHA PEL..... CL 5 mg/m<sup>3</sup>

### **PRINCIPAL SOURCES:**

Manganese is used in making steel and alloys, in dry cell batteries, and in the production of potassium permanganate.

### **ENVIRONMENTAL FATE:**

Manganese and its associated compounds are common air contaminants. The primary removal mechanism for airborne contaminants is washout from rainfall, or settling out gravimetrically of the dusts or product adsorbed onto other particulates. Most manganese compounds are not water soluble and must be physically settled out of wastewater. Aquatic fate of manganese is not well documented.

## MERCURY

(and compounds)

Related compounds: Mercurous chloride, Mercury(I) bromide, Mercury(II) chloride, Mercury(I) cyanamide, Mercury fulminate, Mercury(II) iodide, Mercury(II) oxide, Mercury(II) sulfate, Mercury(II) thionitrosylate etc.

LA DEQ Regulatory Classification: Class 2

CAS Registry Number: 7439976

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### PHYSICAL PROPERTIES:

Physical state:	Silvery, heavy, liquid metal
Odor:	n/a
Boiling point:	356.9° C
Vapor pressure:	0.002 mm Hg at 25° C
Half-life (clean air): (poll. air = 1/10)	n/a

### TOXICOLOGICAL PROPERTIES:

Mercury is a general protoplasmic poison; after absorption it circulates in the blood and is stored in the liver, kidneys, spleen and bone. Mercury is harmful when ingested, inhaled, or handled. Spilled and heated elemental mercury is particularly hazardous, but many compounds of mercury, particularly the fulminates, are very hazardous as well. Soluble salts of mercury have violent corrosive effects on the skin and mucous membranes. High exposure can cause chest pain, shortness of breath, and pulmonary edema. Repeated exposures can cause mercury poisoning characterized by kidney disease, tremors, gum problems, memory lapse, mood changes.

EPA HEA Doc.... Devel., Repro.  
ACGIH TLV..... TWA 0.05 mg(Hg)/m<sup>3</sup> (vapor, skin)  
OSHA PEL..... CL 0.1 mg/m<sup>3</sup>

### PRINCIPAL SOURCES:

Mercury is used in thermometers, barometers, vapor lamps, mirror coatings, in making chemicals and compounds, and in electrical equipment. Mercury is a by-product of mining and was used in great quantities as submarine ballast.

### ENVIRONMENTAL FATE:

Mercury released in the environment tends to settle gravimetrically. Mercury is considered very toxic because it tends to biomagnify in organisms as they move up the food chain. Biodegradation processes performed by aquatic and terrestrial microorganisms tend to produce a form of mercury that is more toxic

# METHANOL

Synonyms: Carbinol, Columbian spirits, Methyl alcohol, Methyl hydroxide

LA DEQ Regulatory Classification: Class 2

CAS Registry Number: 67561

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## PHYSICAL PROPERTIES:

Physical state:	Colorless, mobile liquid
Odor:	Slight alcoholic to pungent
Boiling point:	65° C
Vapor pressure:	100 mm Hg at 21.2° C
Half-life (clean air)	3.1 days
(poll. air = 1/10)	

## TOXICOLOGICAL PROPERTIES:

Acute toxic effects can occur in humans when ingesting or inhaling methanol. These effects include headaches, nausea, vomiting, dizziness, blindness, or death. Contact with the liquid can burn the eyes, and exposure to vapors can irritate the eyes, nose, mouth, and throat. Repeated or prolonged exposure to the skin can cause dryness and cracking, along with the acute effects mentioned. Sub-lethal effects include damage to the liver.

ACGIH TLV... TWA 200 ppm; STEL 250 ppm (skin)  
OSHA PEL... TWA 200 ppm

## PRINCIPAL SOURCES:

Methanol is widely used as a solvent and cleaning agent. Two large users of methanol are the wood processing industry and chemical industry, where it is used in the manufacture of chemicals such as formaldehyde, methacrylates, methyl halides, ethylene glycol, and plastics, to name a few. It is also used to dehydrate natural gas, and denature alcohol.

## ENVIRONMENTAL FATE:

Methanol vapor in the atmosphere reacts relatively quickly and is removed in a few days. In water, volatilization and biodegradation are significant removal mechanisms. Bioconcentration will not occur.

## SELECTED REFERENCES:

2, 5, 7

## METHYL ACRYLATE

Synonyms: Acrylic acid methyl ester, Methoxycarbonylethylene, Methyl propenate, Methyl-2-propenoate, Propenoic acid methyl ester

LA DEQ Regulatory Classification: Class 2

CAS Registry Number: 96333

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### PHYSICAL PROPERTIES:

Physical state:	Colorless liquid
Odor:	Acrid
Boiling point:	80° C
Vapor pressure:	70 mm Hg at 20° C
Half-life (clean air)	n/a
(poll. air = 1/10)	

### TOXICOLOGICAL PROPERTIES:

Methyl acrylate is poisonous if ingested, moderately toxic by skin contact, and mildly toxic when inhaled. Contact with the liquid causes irritation of the skin and eyes. The vapors are irritating to the eyes, nose, and mouth. Chronic exposure has produced injury to lungs, liver, and kidneys in experimental animals.

EPA HEEP Listing...	Acute, Chronic, Aquatic
ACGIH TLV.....	10 ppm (skin)
OSHA PEL.....	10 ppm (skin)

### PRINCIPAL SOURCES:

Methyl acrylate is used in the manufacture of polymers, Vitamin B<sub>1</sub>, adhesives, and surfactants.

### ENVIRONMENTAL FATE:

Information not available.

### SELECTED REFERENCES:

2, 7

## METHYL ETHYL KETONE

Synonyms: 2-Butanone, Ethyl methyl ketone, MEK, Methyl acetone,

LA DEQ Regulatory Classification: Class 2

CAS Registry Number: 78933

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### PHYSICAL PROPERTIES:

Physical state:	Colorless liquid
Odor:	Sweet, sharp
Boiling point:	79.57° C
Vapor pressure:	71.2 mm Hg at 25° C
Half-life (clean air) (poll. air = 1/10)	8.3 days

### TOXICOLOGICAL PROPERTIES:

Typical exposure is by inhalation or absorption through the skin. Methyl ethyl ketone is a very irritating material; contact with the liquid will cause a burning sensation or rash to the skin, and can severely burn the eyes, causing permanent damage. Vapors will irritate the eyes, nose, mouth, and throat. Exposure to high concentrations can cause dizziness, lightheadedness, headache, nausea, and blurred vision. Repeated exposure, in conjunction with other solvents, can damage the nervous system, causing weakness and numbness in the hands and feet. Animal studies indicate that methyl ethyl ketone is a teratogen, so special care should be taken to avoid contact.

ACGIH TLV... TWA 200 ppm; STEL 300 ppm  
OSHA PEL... TWA 200 ppm

### PRINCIPAL SOURCES:

Methyl ethyl ketone is used as a solvent or swelling agent of resins; an intermediate in the manufacture of ketones and amines; a flush-off paint stripper; in the extraction and production of wax from lube oil fractions of petroleum; a solvent in nitrocellulose coatings and vinyl films; in cements and adhesives; in the manufacture of smokeless powder; in cleaning fluids; and, as a printing catalyst and carrier. Some of the major sources of methyl ethyl ketone in the environment are emissions from its general use as a solvent, evaporation from applied paints and coatings, cements and adhesives, cleaning fluids, printing uses, and automobile gasoline combustion.

### ENVIRONMENTAL FATE:

Some methyl ethyl ketone released in water will likely volatilize into air, with the remaining fraction available to biodegradation. In air, it will react with photochemically produced hydroxyl radicals (half-life 1-11 days).

## METHYL ISOBUTYL KETONE

Synonyms: Hexone, Isobutyl methyl ketone, Isopropyl acetone, MIBK, MIK  
4-Methyl-2-pentanone

LA DEQ Regulatory Classification: Class 3

CAS Registry Number: 108101

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### PHYSICAL PROPERTIES:

Physical state:	Clear liquid
Odor:	Sweet, sharp
Boiling point:	118° C
Vapor pressure:	16 mm Hg at 20° C
Half-life (clean air)	24 hours
(poll. air = 1/10)	

### TOXICOLOGICAL PROPERTIES:

Moderately toxic by ingestion. Mildly toxic by inhalation. Very irritating to the skin, eyes and mucous membranes. A human systemic irritant by inhalation. Narcotic in high concentration.

ACGIH TLV... TWA 50 ppm; STEL 75 ppm  
OSHA PEL.... TWA 100 ppm

### PRINCIPAL SOURCES:

Methyl isobutyl ketone is used in many different industrial applications. It is used as a solvent for paints and varnishes, in nitrocellulose lacquers, in the manufacture of methylamylalcohol, in extraction processes, and as a denaturant for alcohol.

### ENVIRONMENTAL FATE:

Methyl isobutyl alcohol released in wastewater will volatilize and biodegrade. In the atmosphere, MIK will react with photochemically produced hydroxyl radicals (estimated half-life in photochemically polluted air is about 2.5 hours).

### SELECTED REFERENCES:

2, 7, 8



## METHYL METHACRYLATE

Synonyms: as-Dimethyl sulphate, Methanesulphonic acid (methyl ester), MMS, Methyl methanesulphonate

LA DEQ Regulatory Classification: Class 2

CAS Registry Number: 80626

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### PHYSICAL PROPERTIES:

Physical state:	Colorless liquid
Odor:	Sharp, fruity
Boiling point:	101° C
Vapor pressure:	28 mm Hg at 20° C
Half-life (clean air) (poll. air = 1/10)	2.7 - 3 days

### TOXICOLOGICAL PROPERTIES:

The primary route of exposure to methyl methacrylate (MMC) is through inhalation, although the migration of this chemical from food wrappings into food items is a possibility. Though not appreciably absorbed through the skin, it will cause allergic reactions in some individuals, and will cause damage or irritation to the eyes. Exposure to the vapors can irritate the nose and throat. High levels can cause you to feel dizzy, lightheaded, and to lose consciousness. Repeated exposure may effect the nervous system or lungs. In experiments with animals, methyl methacrylate has been shown to cause cancer and to damage the developing fetus. It is also a fire and explosion hazard.

### PRINCIPAL SOURCES:

Methyl methacrylate is used in the manufacture of resins and plastics, and is widely used in the manufacture of dentures.

### ENVIRONMENTAL FATE:

When released onto the ground or into water, methyl methacrylate will primarily be lost through volatilization. Some biodegradation or photolytic degradation may occur, but no estimates for the rate of these reactions are available. No appreciable adsorption to sediment or particulate matter will occur. Released to air, MMC will degrade by reaction with reactive atmospheric species.

### SELECTED REFERENCES:

2, 3, 5, 7

## MOLYBDENUM TRIOXIDE

Synonyms: Molybdenum(VI) trioxide, Molybdic anhydride, Molybdic trioxide

LA DEQ Regulatory Classification: Class 3

CAS Registry Number: 1313275

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### PHYSICAL PROPERTIES:

Physical state:	White to slightly yellow powder
Odor:	n/a
Melting point:	795° C
Vapor pressure:	n/a
Half-life (clean air) (poll. air = 1/10)	n/a

### TOXICOLOGICAL PROPERTIES:

Molybdenum is an important trace element in the normal growth and development of plants. It is also found in animal tissue, though its precise function is unknown. Because it is readily absorbable in the intestine, water soluble forms such as molybdenum trioxide may pose a threat to human health. Toxic through ingestion or inhalation. Most likely exposure through inhalation of dust or mist, which can irritate the nose, throat, and bronchial tubes. Eye or skin contact will result in irritation of membranes. Repeated overexposure can cause weight loss, diarrhea, poor muscle coordination, headaches, muscle or joint aches, and anemia. There is limited evidence that molybdenum trioxide causes cancer in animals.

ACGIH TLV... TWA 5 mg(Mo)/m<sup>3</sup>  
OSHA PEL.... TWA 5 mg(Mo)/m<sup>3</sup>

### PRINCIPAL SOURCES:

Molybdenum trioxide is present in some fertilizers, and is used in ceramic glazes, enamels, pigments, and in analytical chemistry. During 1989 approximately 49 million pounds were processed in the U.S. Of this amount 30 million pounds was used by the iron and steel industry, 11 million pounds for other metallurgical uses and approximately 8 million pounds for chemical applications including pigment and catalytic uses. Another significant source of molybdenum is coal fired power plants. A common air contaminant.

### ENVIRONMENTAL FATE:

Information not available.

### SELECTED REFERENCES:

## N-BUTYL ALCOHOL

Synonyms: 1-Butanol, n-Butanol, Butanol, Butyl alcohol, Butyl hydroxide, Methanol propane, 1-Hydroxybutane, Propylcarbanol

LA DEQ Regulatory Classification: Class 3

CAS Registry Number: 71363

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### PHYSICAL PROPERTIES:

Physical state:	Colorless liquid
Odor:	Strong rancid or sweet
Boiling point:	117.5° C
Vapor pressure:	4.4 mm Hg at 20° C
Half-life (clean air)	n/a
(poll. air = 1/10)	

### TOXICOLOGICAL PROPERTIES:

Most likely route of exposure in humans through inhalation or absorption through the skin. Contact can irritate the skin, causing a rash or burning feeling. Exposure can cause headaches and irritate the eyes. It can also irritate the nose and throat. Higher levels may cause you to become dizzy, lightheaded and to pass out. Repeated contact may cause drying and cracking of the skin, damage to the hearing and sense of balance, and damage to the liver and kidneys.

ACGIH TLV... CL 50 ppm (skin)  
OSHA PEL.... TWA 100 ppm

### PRINCIPAL SOURCES:

N-butyl alcohol is used as a solvent for fats, waxes, shellac, resins, gums, and varnish. It is also present in leachate from sanitary landfills. Releases to the environment are primarily in association with its manufacture and use in the manufacture of other products.

### ENVIRONMENTAL FATE:

Information not available.

### SELECTED REFERENCES:

2, 5, 7

## NICKEL (and compounds)

Related compounds: Nickel(II) acetate, Nickel carbonyl, Nickel cyanide, Nickel(II) fluoride, Nickel iron sulfide, Nickel monoxide, Nickel peroxide, Nickel potassium cyanide, Nickel refinery dust, Nickel sulfate, etc.

LA DEQ Regulatory Classification: Class 1

CAS Registry Number: 7440020

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### PHYSICAL PROPERTIES:

Physical state:	Silvery metal, or yellow to green compd.
Odor:	none
Boiling point:	n/a
Vapor pressure:	n/a
Half-life (clean air) (poll. air = 1/10)	n/a

### TOXICOLOGICAL PROPERTIES:

Exposure of the general population to nickel and its compounds results from breathing air, ingesting water and food that contain nickel and compounds, and skin contact with a wide range of consumer products containing nickel. The most common adverse effect from nickel exposure are skin allergies. Animal studies indicate that exposure to nickel compounds can be carcinogenic, can increase susceptibility to respiratory infection, and has adverse reproductive effects (miscarriage, complications, low birth weight).

NTP Classification.....	CS (metal), CA (compounds)
IARC Classification...	1
EPA Classification.....	A
ATS. Profile.....	Devel., Repro., Acute, Chronic
ACGIH TLV.....	TWA 1 mg(Ni)/m <sup>3</sup>
OSHA PEL.....	TWA 1 mg(Ni)/m <sup>3</sup>

### PRINCIPAL SOURCES:

The primary source of nickel in the atmosphere is from the burning of fuel oil. Nickel emissions from the combustion of fossil fuels appear to be primarily in the form of nickel sulfate, followed by lesser amounts of nickel oxide and complex oxides of nickel. In the Baton Rouge area, industrial fuel sources are compounded with refinery emissions of nickel, whose source is due to erosion of catalyst in refinery catalytic cracking processes.

# NITRIC ACID

Synonyms: Azotic acid, Hydrogen nitrate,

LA DEQ Regulatory Classification: Class 3

CAS Registry Number: 7697372

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## PHYSICAL PROPERTIES:

Physical state:	Colorless, yellow or red fuming liquid
Odor:	Strong, suffocating
Boiling point:	86° C
Vapor pressure:	2.6 - 103 mm Hg at 20° C
Half-life (clean air) (poll. air = 1/10)	n/a

## TOXICOLOGICAL PROPERTIES:

Toxic by ingestion or inhalation. Dermal contact produces severe burns which can result in permanent damage. Breathing the vapor can irritate the lungs. Higher exposure can cause pulmonary edema. The predominant dangers from this powerful corrosive lie in its acute effects, which include its extreme reactivity. Chronic effects include erosion of the teeth and possible chronic lung damage.

ACIH TLV... TWA 2 ppm; STEL 4 ppm  
OSHA PEL.... TWA 2 ppm

## PRINCIPAL SOURCES:

Nitric acid is widely used in the manufacture of fertilizer, dyes, explosives, and many other chemicals. It is also used as a laboratory reagent.

## ENVIRONMENTAL FATE:

Airborne nitric acid will combine with moisture to contribute to acid rain.

## SELECTED REFERENCES:

2, 5

# NITROBENZENE

Synonyms: Mirbane oil, Nitrobenzol, Oil of Mirbane, Essence of Mirbane

LA DEQ Regulatory Classification: Class 2

CAS Registry Number: 98953

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## PHYSICAL PROPERTIES:

Physical state:	Yellow to brown, oily liquid
Odor:	Bitter almond, shoe polish smell
Boiling point:	210° C
Vapor pressure:	0.15 mm Hg at 20° C
Half-life (clean air)	n/a
(poll. air = 1/10)	

## TOXICOLOGICAL PROPERTIES:

Exposure to nitrobenzene usually occurs by inhalation or absorption through the skin. Exposure can lower the ability of the blood to carry oxygen (methemoglobinemia), which can progress gradually over a period of weeks. The first symptoms may be headaches or narcotic high; with further exposure, the symptoms progress to lightheadedness, loss of balance, weakness, trouble breathing, bluish color to the lips and ears, collapse, and death. Other symptoms of chronic exposure include decreased vision acuity, abnormal blood count, skin allergy, and liver damage.

ACGIH TLV.... TWA 1 ppm (skin)  
OSHA PEL..... TWA 1 ppm (skin)

## PRINCIPAL SOURCES:

Nitrobenzene is produced in large quantities due to its wide range of uses, which include: the manufacture of aniline and dyestuffs; solvent recovery; rubber production; use in drugs, photographic chemicals, metal and shoe polish; solvent for cellulose ethers; and in the manufacture of cellulose acetate. Releases into the environment are associated with these uses, in addition to the formation in the atmosphere from the photochemical reaction of benzene with oxides of nitrogen. The greatest concentrations of nitrobenzene occur near facilities which use it in the production of aniline.

## ENVIRONMENTAL FATE:

Nitrobenzene is moderately adsorbed to soil and should leach into the ground if released on land. In water, it is susceptible to biodegradation, particularly if the microorganisms are acclimated to it. Other important removal mechanisms include volatilization and adsorption. Nitrobenzene will degrade in the

## 2-NITROPROPANE

Synonyms: Dimethylnitromethane, Isonitropropane, Nipar S-20 solvent, 2-NP, Nitroisopropane,  $\beta$ - Nitropropane

LA DEQ Regulatory Classification: Class 2

CAS Registry Number: 79469

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### PHYSICAL PROPERTIES:

Physical state:	Colorless liquid
Odor:	Fruity
Boiling point:	120° C
Vapor pressure:	10 mm Hg at 25° C
Half-life (clean air) (poll. air =1/10)	n/a

### TOXICOLOGICAL PROPERTIES:

Most likely route of exposure through inhalation, although it may be ingested. Exposure can cause headaches, nausea and vomiting, dizziness and diarrhea. At levels causing these symptoms, severe liver damage can occur and can cause death. Exposure to fumes can irritate the eyes, nose, and throat. Higher levels can irritate the lungs and cause pulmonary edema. Exposure may interfere with the ability of the blood to carry oxygen with the resultant headaches, weakness, and bluish pallor to the skin. 2-Nitropropane is a mutagen, and may damage the developing fetus.

NTP Classification.....	CS
IARC Classification...	2B
EPA Classification.....	B2
ACGIH TLV.....	TWA 10 ppm
OSHA PEL.....	TWA 25 ppm

### PRINCIPAL SOURCES:

2-Nitropropane is used as a solvent for vinyl and epoxy coatings, as a rocket propellant, and gasoline additive. It is also used as a chemical intermediate in the manufacture of other chemicals.

### ENVIRONMENTAL FATE:

Information not available.

### SELECTED REFERENCES:

2, 5

## PHENOL

Synonyms: Benzenol, Carboic acid, Hydroxybenzene, Monophenol, Phenic acid, Phenol alcohol, NCI-C50124, Phenyl alcohol

LA DEQ Regulatory Classification: Class 2

CAS Registry Number: 108952

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### PHYSICAL PROPERTIES:

Physical state:	Colorless to white solid or liquid
Odor:	Sickeningly sweet & acrid
Boiling point:	181.84° C at 760mm Hg
Vapor pressure:	0.41 mm Hg at 25° C
Half-life (clean air) (poll. air = 1/10)	>1 days

### TOXICOLOGICAL PROPERTIES:

Can be absorbed into the body through ingestion, inhalation, and dermal contact. Entry through the skin is the major route of exposure, and can account for half of the phenol that enters the body when a person is exposed to phenol in air. Repeated exposure to low levels of phenol in drinking water has been associated with diarrhea and mouth sores. Exposure to high concentrations of phenol in air for short periods is irritating to the lungs, and can result in severe injury to the heart, liver, kidneys and lungs if exposure time is long. Exposure of large areas of the body (>25%) to even dilute solutions can cause death.

HEEP Listing..... Devel., Acute, Chronic, Aquatic  
ACGIH TLV..... TWA 5 ppm (skin)  
OSHA PEL..... TWA 5 ppm (skin)

### PRINCIPAL SOURCES:

The largest single use of phenol is the production of phenolic resins. Phenol-formaldehyde resins are used in the plywood, construction, automotive and appliance industries. Phenol is also used as an intermediate in the production of nylon, 2,4-D, salicylic acid, pharmaceuticals and dyes, and is used directly in many medicinal preparations. U.S. production of phenol in 1988 approached 3.6 billion pounds.

### ENVIRONMENTAL FATE:

During manufacture, phenol is released primarily to the atmosphere from storage tank vents and during transport loading. Other sources of release to the atmosphere are residential woodburning and automobile exhaust. Phenol disappears rapidly in air by gas-phase hydroxyl radical reaction, but may persist in water for somewhat longer periods.



# PHOSGENE

Synonyms: Carbon oxychloride, Carbonyl chloride, Chloroformyl chloride,  
Diphosgene, NCI-C60219

LA DEQ Regulatory Classification: Class 3

CAS Registry Number: 75445

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## PHYSICAL PROPERTIES:

Physical state:	Colorless gas, clear to yellow liquid
Odor:	Characteristic hay-like
Boiling point:	8.1° C
Vapor pressure:	1.6 atm. at 20° C
Half-life (clean air)	n/a
(poll. air = 1/10)	

## TOXICOLOGICAL PROPERTIES:

Phosgene is acutely toxic when inhaled or contacted in any way. Exposure to low levels may at first cause only slight irritation of the eyes, nose and throat, or even no discomfort at all. Hours later, however, severe lung burns and a build-up of fluid in the lungs (pulmonary edema) can occur, which may result in death. Contact with the liquid will cause severe skin and eye burns with permanent damage. Repeated exposure to even very low levels can cause permanent lung damage such as chronic emphysema and bronchitis, with susceptibility to pneumonia.

EPA HEA Doc..... Acute  
ACGIH TLV..... 0.1 ppm  
OSHA PEL..... 0.1 ppm

## PRINCIPAL SOURCES:

Phosgene is used in the manufacture of polyurethanes, resins, isocyanates, pesticides, herbicides, pharmaceuticals and dyes. It is also present in small quantities (<0.5 ppm) in incinerator flue gases.

## ENVIRONMENTAL FATE:

Upon exposure to moisture, phosgene decomposes into hydrochloric acid and carbon monoxide. This is why inhalation of phosgene results in a delayed effect. Environmentally, this means that phosgene will not persist very long if moisture is available. Its primary danger is from acute poisoning to those in the immediate vicinity of a release.

## PHOSPHORIC ACID

Synonyms: Orthophosphoric acid

LA DEQ Regulatory Classification: Class 3

CAS Registry Number: 7664382

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### PHYSICAL PROPERTIES:

Physical state:	Colorless liquid or rhombic crystals
Odor:	Pleasant
Melting point:	42.35° C
Vapor pressure:	0.0285 mm Hg at 20° C
Half-life (clean air) (poll. air = 1/10)	n/a

### TOXICOLOGICAL PROPERTIES:

Moderately toxic by ingestion and skin contact. A corrosive irritant to the eyes, skin, and mucous membranes. A common air contaminant.

ACGIH TLV... TWA 1 mg/m<sup>3</sup>  
OSHA PEL... TWA 1 mg/m<sup>3</sup>; STEL 3 mg/m<sup>3</sup>

### PRINCIPAL SOURCES:

Phosphoric acid was the ninth highest-volume chemical produced in the U.S. in 1979. It is produced by the action of hydrochloric acid on phosphate rock, with extraction by tributylphosphate. It is used in fertilizers, soaps and detergents, pharmaceuticals, sugar refining, gelatin manufacture, water treatment, animal feeds, in electroplating, and as a gasoline additive. It is also used as a catalyst for ethanol manufacture, in waxes and polished, and as a binder for ceramics.

### ENVIRONMENTAL FATE:

Information not available.

### SELECTED REFERENCES:

2, 8

## PHTHALIC ANHYDRIDE

Synonyms: 1,2-Benzenedicarboxylic acid anhydride, ESEN, 1,3-Dioxophthalan,  
1,3-Isovenzofurandione, NCI-C03601, 1,3-Phthalandione, Retarder AK

LA DEQ Regulatory Classification: Class 3

CAS Registry Number: 85449

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### PHYSICAL PROPERTIES:

Physical state:	White solid
Odor:	Choking
Melting point:	130.8° C
Vapor pressure:	0.0002 mm Hg at 20° C
Half-life (clean air) (poll. air = 1/10)	n/a

### TOXICOLOGICAL PROPERTIES:

May enter body through inhalation. Contact with solid can cause severe skin burns. If spilled on the skin, it is not immediately painful, but may produce a deeper burn if not removed immediately. It can severely burn the eyes, causing permanent damage. Breathing the vapor may irritate the lungs, causing coughing and/or shortness of breath. Chronic effects from exposure may include a skin allergy, asthma-like lung allergy, and lung damage.

EPA HEEP Listing... Chronic, Neuro.  
ACGIH TLV..... TWA 1 ppm  
OSHA PEL..... TWA 2 ppm

### PRINCIPAL SOURCES:

Phthalic anhydride is found in industries which oxidize xylenes and naphthalene. Phthalic anhydride is used in the manufacture of plasticizers, specialty chemicals, synthetic fibers, dyes, pigments, pharmaceuticals, insecticides, and chlorinated products.

### ENVIRONMENTAL FATE:

Biodegradable in water.

### SELECTED REFERENCES:

2, 5 7

## POLYNUCLEAR AROMATIC HYDROCARBONS

Synonyms: PAH; examples include: Benzo(a)pyrene, naphthalene,  
Benz(a)anthracene

Regulatory Classification: Unclassified

CAS Registry Number:

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### PHYSICAL PROPERTIES:

Physical state:	In pure state, generally crystalline solid
Odor:	Varies, generally aromatic
Melting point:	Varies
Vapor pressure:	n/a
Half-life (clean air) (poll. air = 1/10)	n/a

### TOXICOLOGICAL PROPERTIES:

Polynuclear aromatic hydrocarbons (PAHs) are a fairly common contaminants in air, water, and food. They may therefore be ingested or inhaled. Experiments with animals indicate that PAHs such as benzo(a)pyrene are teratogenic, tumorigenic, and carcinogenic agents. Exposures are greatest to workers around fossil fuel combustion sources, refuse incinerators, coke manufacturing facilities, oil refineries, and asphalt manufacturing or tarring facilities. The hazards of exposure to PAHs are not derived so much from acute or chronic effects, but are derived primarily from the risks associated with tumorigenic or carcinogenic substances.

### PRINCIPAL SOURCES:

Polynuclear aromatic hydrocarbons are formed under geothermal conditions leading to coal and petroleum formation. They are found in oils, waxes, creosote, coal tar, and smoke. PAHs are generally not manufactured, but are common contaminants in combustion processes, particularly of coal combustion. They are present in raw coal, from which they may leach out into the environment. They are also present in automobile emissions and cigarette smoke.

### ENVIRONMENTAL FATE:

PAHs are high carbon, heavy components of petroleum and coal tars. They are relatively persistent in the environment, though they are susceptible to biodegradation. PAHs are usually the last component to disappear following spills of petroleum into the water or onto land. PAHs generated from combustion sources are usually emitted into the air from which they may settle out as particulate, or wash out in rainfall. Following dry or wet deposition, they may become food or water contaminants.

## PROPIONALDEHYDE

Synonyms: Methylacetaldehyde, Propaldehyde, Propanal, Propyl aldehyde

LA DEQ Regulatory Classification: Class 3

CAS Registry Number: 123386

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### PHYSICAL PROPERTIES:

Physical state:	Liquid
Odor:	Sweet, acrid, irritating
Boiling point:	48° C
Vapor pressure:	235 mm Hg at 20° C
Half-life (clean air) (poll. air = 1/10)	.9 days

### TOXICOLOGICAL PROPERTIES:

Moderately toxic by skin contact and ingestion. Mildly toxic by inhalation. A skin and severe eye irritant.

### PRINCIPAL SOURCES:

Propionaldehyde is formed by the oxidation of propyl alcohol with dichromate, or by passing propyl alcohol over copper at elevated temperatures. It is used in the manufacture of propionic acid, polyvinyl and other plastics synthesis of rubber chemicals, in disinfectants and preservatives. It is also found in the exhaust gasses of gasoline combustion.

### ENVIRONMENTAL FATE:

Propionaldehyde in wastewater will volatilize and biodegrade. In the atmosphere, reactions with photochemically generated hydroxyl radicals will result in rapid removal (half-life less than one day).

### SELECTED REFERENCES:

2, 7, 8

## PROPYLENE OXIDE

Synonyms: Epoxyp propane, Methyl ethylene oxide, Methyl oxirane, NCI-C50099, Propene oxide, Propylene epoxide, 1,2-Propylene oxide

LA DEQ Regulatory Classification: Class 1

CAS Registry Number: 75569

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### PHYSICAL PROPERTIES:

Physical state:	Colorless liquid
Odor:	Ethereal
Boiling point:	34.23° C
Vapor pressure:	532.1 mm Hg at 25° C
Half-life (clean air) (poll. air = 1/10)	19.3 days

### TOXICOLOGICAL PROPERTIES:

Propylene oxide may enter the body from ingestion of contaminated food or water, or inhalation of the gas. Since propylene oxide is approved by the USFDA as a fumigant for certain fruits and food products, ingestion may be a significant source of entry into the body. Occupational exposure by inhalation or dermal contact related to the production, storage, transport, and use of this product is also significant, as well as inhalation exposure to those living in the vicinity of air emission sources. Animal experimentation indicates that propylene oxide is a carcinogen.

IARC Classification... 2A  
HEEP Listing..... Devel., Repro., Acute, Chronic  
ACGIH TLV..... TWA 20 ppm  
OSHA PEL..... TWA 100 ppm

### PRINCIPAL SOURCES:

Atmospheric emissions of propylene from propylene oxide manufacturing processes during 1978 were estimated to be about 1.16 million lbs. Propylene oxide is used in the manufacture of urethane polyols, propylene glycol, surfactant polyols, di- and tripropylene glycols, glycol ethers, and other applications. It may also be emitted to the atmosphere in automobile exhaust and combustion exhausts of stationary sources that burn hydrocarbons. It is also used as a fumigant for certain food items.

### ENVIRONMENTAL FATE:

The aqueous hydrolysis of propylene oxide occurs at an environmentally significant rate; therefore, hydrolysis in moist soil conditions is likely to be

## PYRIDINE

Synonyms: Azabenzene, Azine, NCI-C55301, RCRA Waste #U196

LA DEQ Regulatory Classification: Class 2

CAS Registry Number: 110861

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### PHYSICAL PROPERTIES:

Physical state:	Colorless to yellow liquid
Odor:	Strong , sickening
Boiling point:	255° C
Vapor pressure:	18 mm Hg at 20° C
Half-life (clean air)	n/a
(poll. air = 1/10)	

### TOXICOLOGICAL PROPERTIES:

Most likely route of entry into human body is through inhalation or absorption through the skin. Contact with liquid or vapor can burn and damage the eyes. Exposure can irritate the eyes, nose, throat, and skin. Higher levels can cause stomach upset, headache, mental changes and even coma and death. Repeated exposure to lower levels can cause severe liver injury and brain damage, with personality changes and confusion.

EPA HEEP Listing... Chronic, Aquatic  
ACGIH TLV..... TWA 5 ppm  
OSHA PEL..... TWA 5 ppm

### PRINCIPAL SOURCES:

Pyridine is obtained by coal carbonization and recovery, or manufactured synthetically from acetaldehyde and ammonia. It is used in the synthesis of vitamins and drugs, as a solvent, as a waterproofing agent, as a denaturant for alcohol and antifreeze mixtures, in textile dyeing, and in fungicides.

### ENVIRONMENTAL FATE:

Pyridine released to water can be photodegraded by U.V. light and biodegraded effectively in wastewater treatment facilities. These reactions in lakes and streams would undoubtedly take much longer than under artificial conditions. Although some pyridine would be expected to volatilize from water releases, the fate of volatilized pyridine or air releases of this compound is undocumented.

### SELECTED REFERENCES:

2, 3, 7, 8

## **SELENIUM (& compounds)**

Related compounds: Selenious acid, Selenium(IV) dioxide, Selenium Hexafluoride,  
Selenium oxychloride, Selenium tetrachloride

LA DEQ Regulatory Classification: Class 2

CAS Registry Number: 7782492

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### **PHYSICAL PROPERTIES:**

Physical state:	Various-crystalline, amorphous, colloidal, compounds vary
Odor:	n/a
Melting point:	Varies
Vapor pressure:	n/a
Half-life (clean air) (poll. air = 1/10)	n/a

### **TOXICOLOGICAL PROPERTIES:**

Selenium is a naturally occurring element that is an essential nutrient for humans and animals. Selenium is available as a nutrient in many foods, including vegetables, meat, seafood, and especially grains and grain products. The normal dietary intake of selenium, about 50 to 150 micrograms per day, is sufficient to meet the daily nutritional requirements for this essential element. Selenium is toxic to humans and animals, however, when consumed in amounts that are not much higher than the amounts required to maintain good nutritional status. Selenium can accumulate in tissues in the human body, primarily in the liver and kidneys, and to a lesser degree in the blood, lungs, heart, and testes. When humans in occupational settings have inhaled selenium dust and airborne selenium compounds, they have reported dizziness, fatigue, irritation of mucous membranes, and in extreme cases pulmonary edema and severe bronchitis. Humans who have accidentally consumed large quantities of selenium experienced upset stomachs, muscular weakness, labored breathing, and pulmonary edema.

EPA HEA Doc.... Devel., Repro., Chronic  
ACGIH TLV..... 0.2 mg(Se)/ m<sup>3</sup>  
OSHA PEL..... 0.2 mg(Se)/ m<sup>3</sup>

### **PRINCIPAL SOURCES:**

Selenium and its compounds are used in a variety of products. The metal is useful in photoelectric cells, semiconductors, and electronics. Its compounds are used in glass manufacture and insecticides (Na<sub>2</sub>SeO<sub>4</sub>), in anti-dandruff shampoos and veterinary medicines (SeS & SeS<sub>2</sub>), as a solvent (SeOCl<sub>2</sub>), in lubricants (WSe<sub>2</sub>), and as a gaseous electric insulator (SeF<sub>6</sub>), to name a few.



## **SILVER** (and compounds)

Related Compounds: Silver ammonium nitrate, Silver bromofluoride, Silver collargol, Silver cyanide, Silver oxide, Silver peroxide, etc.

LA DEQ Regulatory Classification: Unclassified

CAS Registry Number: 7440224 (metal)

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### **PHYSICAL PROPERTIES:**

Physical state:	White lustrous metal, compounds vary
Odor:	n/a
Melting point:	962° C
Vapor pressure:	n/a
Half-life (clean air) (poll. air = 1/10)	n/a

### **TOXICOLOGICAL PROPERTIES:**

An experimental tumorigen. Human systemic effects by inhalation, causing a condition termed argyrosis (general greying of the skin caused by silver deposits in tissues). The water soluble silver compounds are irritating to the skin and mucous membranes and may cause death if ingested.

ACGIH TLV... TWA 0.1  $\mu\text{g}/\text{m}^3$  (metal)  
TWA 0.01  $\mu\text{g}(\text{Ag})/\text{m}^3$  (compounds)

OSHA PEL.... TWA 10  $\mu\text{g}/\text{m}^3$

### **PRINCIPAL SOURCES:**

Silver is a by-product of operations on copper, zinc, lead, or gold ores, but some smelters still operate on native silver ores. In addition to its uses as a metal, silver is used in the manufacture of silver nitrate, silver bromide, photographic chemicals, lining of chemical reaction vessels, as a catalyst in the manufacture of ethylene, to produce mirrors, and in plating.

### **ENVIRONMENTAL FATE:**

Information not available.

### **SELECTED REFERENCES:**

2, 5, 8

# STYRENE MONOMER

Synonyms: Cinnamene, Ethenylbenzene, Phenylethylene, Styrolene, Vinylbenzene

LA DEQ Regulatory Classification: Class 2

CAS Registry Number: 100425

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## PHYSICAL PROPERTIES:

Physical state:	Colorless, oily liquid
Odor:	Aromatic
Boiling point:	146° C
Vapor pressure:	4.5 mm Hg at 20° C
Half-life (clean air) (poll. air = 1/10)	.5 days

## TOXICOLOGICAL PROPERTIES:

Human exposure primarily through inhalation or absorption through the skin. Exposure can irritate the eyes, nose, throat, and skin. Higher levels can cause you to feel dizzy, lightheaded, or pass out. Very high levels could cause brain or liver damage severe enough to cause death. Repeated exposure can cause memory and concentration difficulty, slowed reflexes, and loss of balance. Styrene monomer causes mutations, and produces undesirable reproductive effects such as decreased fertility and damage to the developing fetus.

IARC Classification... 2B  
ACGIH TLV..... TWA 50 ppm; STEL 100 ppm (skin)  
OSHA PEL..... TWA 100 ppm; CL 200 ppm

## PRINCIPAL SOURCES:

Styrene monomer is used primarily in the production of styrene polymer plastics. Styrene is released into the environment by emissions and effluents from its production and use. It is also found in automobile exhaust, acetylene flames, and stack emissions from waste incineration, probably due to combustion of polystyrene products. Likely consumer exposure sources result from the use of such styrene containing products as floor waxes and polishes, paints, adhesives, putty, metal cleaners, autobody fillers, fiberglass boats, and varnishes.

## ENVIRONMENTAL FATE:

When released onto land, styrene monomer is subject to biodegradation at rates of 2.3-12% per week if well mixed into soil, however, if buried in drums or in great quantity, it may leach into underlying groundwater, persisting for years in this relatively sterile environment. In water, the dominant removal mechanism is volatilization, with biodegradation removing significant amounts

## SULFURIC ACID

Synonyms: Hydrogen sulfate, Matting acid, Nordhausen acid, Oil of Vitriol

LA DEQ Regulatory Classification: Class 3

CAS Registry Number: 7664939

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### PHYSICAL PROPERTIES:

Physical state:	Colorless, oily liquid
Odor:	No odor, burning fumes
Boiling point:	290° C
Vapor pressure:	1 mm Hg at 145.8° C
Half-life (clean air) (poll. air = 1/10)	n/a

### TOXICOLOGICAL PROPERTIES:

Sulfuric acid is a strong corrosive which can cause irritation and damage by any route of exposure. Contact with strong solutions can cause severe skin burns and permanent damage to the eyes. Inhalation of vapors causes irritation of the mouth, nose, and throat. High levels may irritate the lungs, causing coughing and shortness of breath, or pulmonary edema. Sensitivity to sulfuric acid mists or vapors varies with individuals. Normally 0.125-0.50 ppm may be mildly annoying and 1.5-2.5 ppm definitely unpleasant, 10-20 ppm is unbearable. Workers exposed to low concentrations of the vapor gradually lose their sensitivity to its irritating action. Inhalation of concentrated vapor or mists from hot acid or oleum can cause rapid loss of consciousness with serious damage to lung tissue. Severe exposure may cause a chemical pneumonitis. Other chronic effects may include erosion of the teeth, skin rash, and lung injury.

ACGIH TLV..... TWA 1 mg/m<sup>3</sup>; STEL 3 mg/m<sup>3</sup>  
OSHA PEL..... TWA 1 mg/m<sup>3</sup>  
EPA HEA Doc.... Chronic

### PRINCIPAL SOURCES:

Condensed Chemical Dictionary states that sulfuric acid is "by far the most widely used industrial chemical". Estimated production in 1979 was 80 billion pounds, the highest volume chemical produced in the U.S. (1979). Uses of sulfuric acid include but are not limited to: fertilizer manufacture, chemicals, dyes and pigments, petroleum refining, etchant, alkylation catalyst, electroplating baths, iron and steel production, rayon and film, industrial explosives, nonferrous metallurgy, and general laboratory reagent. Sulfuric acid is also formed indirectly from combustion processes from sulfur dioxide emissions.

## 1,1,2,2-TETRACHLOROETHANE

Synonyms: Acetylene tetrachloride, 1,1-Dichloro-2,2-Dichloroethane, TCE,  
NCI-C03554, Tetrachloroethane

LA DEQ Regulatory Classification: Class 2

CAS Registry Number: 79345

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### PHYSICAL PROPERTIES:

Physical state:	Heavy, colorless liquid
Odor:	Chloroform like
Boiling point:	146.4° C
Vapor pressure:	8 mm Hg at 20° C
Half-life (clean air) (poll. air = 1/10)	n/a

### TOXICOLOGICAL PROPERTIES:

Human exposure is primarily through inhalation or absorption through the skin. Contact with the liquid or vapor can cause severe damage to the eyes and irritation of the skin, nose, mouth and throat. Low level exposure can cause dizziness and drowsiness. Poor appetite, nausea, or weakness may occur. Higher levels may cause unconsciousness and death. Short-term exposure can damage the liver and kidneys, or cause nerve effects such as tremors, headaches, irritability, or insomnia. In animal tests, 1,1,2,2-tetrachloroethane has been shown to cause cancer and teratogenic (reproductive) effects.

IARC Classification...	3
EPA Classification.....	C
EPA HEA Doc.....	Chronic, Neuro.
ACGIH TLV.....	TWA 1 ppm
OSHA PEL.....	TWA 1 ppm

### PRINCIPAL SOURCES:

1,1,2,2-Tetrachloroethane is used in making other chemicals, insecticides, paints, rust removers, and varnishes. Considered the most toxic of the common chlorinated hydrocarbons, its use has been restricted or forbidden in certain countries. In addition to its acute human toxicity, it is very reactive, emitting chlorine fumes as it decomposes.

### ENVIRONMENTAL FATE:

In water, the primary removal mechanism is evaporation into the atmosphere, where its fate is uncertain.

## 1,1,2,2-TETRACHLOROETHYLENE

Synonyms: Carbon dichloride, Dow-Per, Ethylene tetrachloride, NCI-C04580, Perchloroethylene, Tetracap, Tetrachloroethene, Tetrachloroethylene

LA DEQ Regulatory Classification: Class 2

CAS Registry Number: 127184

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### PHYSICAL PROPERTIES:

Physical state:	Colorless liquid
Odor:	Chloroform-like
Boiling point:	121.2° C
Vapor pressure:	14 mm Hg at 20° C
Half-life (clean air) (poll. air = 1/10)	n/a

### TOXICOLOGICAL PROPERTIES:

Most likely human exposure through inhalation or dermal contact. Contact with the liquid can cause severe eye and skin burns. Exposure to the vapor can cause irritation of the eyes, nose, mouth, and throat. Breathing the vapor can irritate the lungs, causing coughing, shortness of breath, and at higher exposures, pulmonary edema which may be delayed in onset. Overexposure can cause tachycardia, and serious liver and kidney damage. Animal studies indicate that 1,1,2,2-tetrachloroethylene is a human carcinogen and can cause damage to the developing fetus.

IARC Classification...	2B
EPA Classification.....	B2
ACGIH TLV.....	TWA 50 ppm (skin); STEL 200 ppm
OSHA PEL.....	TWA 100 ppm; CL 200 ppm

### PRINCIPAL SOURCES:

1,1,2,2-Tetrachloroethylene is widely used in dry cleaning operations, as a metal degreaser, as a solvent for fats, greases, waxes, rubber, and gums, for coffee decaffeination, in paint removers, printing inks, and in the production of fluorocarbons.

### ENVIRONMENTAL FATE:

Environmental fate is uncertain.

### SELECTED REFERENCES:

2, 5, 7

## THALLIUM (and compounds)

Related Compounds: Thallium acetate, Thallium bromide, Thallium chloride, Thallium fluoride, Thallium nitrate, Thallium oxide, Thallium selenide, Thallium sulfate, Thallous malleate

LA DEQ Regulatory Classification: Unclassified

CAS Registry Number: 7440280

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### PHYSICAL PROPERTIES:

Physical state:	Bluish-white, soft metal, compounds vary
Odor:	n/a
Melting point:	303.5° C
Vapor pressure:	n/a
Half-life (clean air) (poll. air = 1/10)	n/a

### TOXICOLOGICAL PROPERTIES:

Thallium can affect you when breathed in, ingested, or by passing through your skin. Thallium is an extremely toxic poison, but symptoms of poisoning may be delayed for days after exposure. Effects include weakness, irritability, pain in arms and legs, confusion and mood changes, hair loss, loss of vision, and permanent brain damage. High exposures can cause tremors, convulsions, hallucinations, coma and death.

ACGIH TLV... TWA 0.1 mg(Tl)/m<sup>3</sup>  
OSHA PEL.... TWA 0.1 mg(Tl)/m<sup>3</sup>

### PRINCIPAL SOURCES:

Thallium is found in the flue dusts of lead and zinc smelting. The thallium compounds recovered are treated to obtain the metal by electrolysis, precipitation, or reduction. Thallium metal is used to manufacture salts of thallium, mercury alloys, low-melting glasses, and is used in photoelectric cells and in electrodes in dissolved oxygen analyzers.

### ENVIRONMENTAL FATE:

Thallium is insoluble in water, but the fact that it readily forms soluble compounds when exposed to air or water would indicate the possibility of bioaccumulation in aquatic organisms.

### SELECTED REFERENCES:

2, 5, 8

# TOLUENE

Synonyms: Methylbenzene, Methylbenzol, NCI-C07272, Phenylmethane, Toluol

Regulatory Classification: Class 2

CAS Registry Number: 108883

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## PHYSICAL PROPERTIES:

Physical state:	Colorless liquid
Odor:	Sweet, pungent
Boiling point:	110.4° C
Vapor pressure:	22 mm Hg at 20° C
Half-life (clean air)	4.5 days
(poll. air = 1/10)	

## TOXICOLOGICAL PROPERTIES:

The primary exposure route for humans is through inhalation, although exposure may occur through ingestion of contaminated water or food and by absorption through the skin. The primary health concern in humans from exposure to toluene is its narcotic and toxic effects on the nervous system. Short-term exposure to low-to-moderate concentrations, such as occurs in the workplace, can produce fatigue, confusion, general weakness, memory loss, nausea, and loss of appetite. Repeated exposure may cause damage to the bone marrow, liver, kidney and brain. Toluene may cause mutations in living cells, but whether or not it poses a cancer hazard needs further study.

EPA HEA Doc..... Devel., Repro.  
ACGIH TLV..... 100 ppm; STEL 150 ppm  
OSHA PEL..... 200 ppm; CL 300 ppm

## PRINCIPAL SOURCES:

The major use of toluene is as a component of gasoline, both as an additive and as a non-isolated component. Other industrial uses for toluene include its use in the synthesis of benzene, urethane foams, and other organic chemicals. Toluene is used in such consumer goods as paints, inks, adhesives, cleaning agents, pharmaceuticals, dyes, and nail products. Toluene is regulated by the Resource Conservation and Recovery Act as a hazardous waste and is therefore subject to RCRA regulations for storage, transport and disposal.

## ENVIRONMENTAL FATE:

Air emissions constitute the majority of industrial releases of toluene. Toluene released into water or onto land primarily volatilizes into the air as well. In the atmosphere, it is rapidly degraded by reaction with hydroxyl radicals to yield cresol and benzaldehyde, which in turn break down into simple hydrocarbons.

## TOLUENE-2,4-DIISOCYANATE

Synonyms: Toluene diisocyanate, Isocyanic acid (Methylphenylene ester), TDI,  
4-Methyl-phenylene diisocyanate, NCI-C50533

LA DEQ Regulatory Classification: Class 2

CAS Registry Number: 584849

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### PHYSICAL PROPERTIES:

Physical state:	Colorless to pale yellow liquid
Odor:	Strong, fruity
Boiling point:	251° C
Vapor pressure:	0.01 mm Hg at 20° C
Half-life (clean air) (poll. air = 1/10)	3.3 hours

### TOXICOLOGICAL PROPERTIES:

Probable route of human exposure by inhalation, or in industrial settings, through dermal contact. Contact with liquid will cause damage to the eyes, and burning and redness of the skin. Exposure to vapors irritates the eyes, nose, throat. Higher levels can cause coughing, tightness of the chest, and fluid in the lungs, along with lightheadedness and unconsciousness. Repeated exposure can cause asthma and damage to the lungs, along with neurological disorders. Toluene-2,4-diisocyanate is a probable human carcinogen, and can cause temporary impotence in men.

NTP Classification..... CS  
IARC Classification... 2B  
HEEP Listing..... Repro., Acute, Aquatic  
ACGIH TLV..... TWA 0.005 ppm; STEL 0.02 ppm  
OSHA PEL..... CL 0.02 ppm

### PRINCIPAL SOURCES:

Toluene-2,4-diisocyanate (TDI) is used in the production of polyurethane foam. Releases to the environment may occur during its commercial production, handling, and processing prior to its use in polyurethane foam production, and during the foam production process. Large quantities of TDI are transported by rail, road, and sea, presenting the possibility of accidental releases during transport, loading and unloading.



## TOLUENE-2,6-DIISOCYANATE

Synonyms: 2,6-Diisocyanato-1-methylbenzene, 2,6-Diisocyanatoluene, 2,6-TDI, NIAX-TDI, m-Toluene diisocyanate

Regulatory Classification: Class 2

CAS Registry Number: 91087

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### PHYSICAL PROPERTIES:

Physical state:	White to pale yellow liquid
Odor:	Strong, sharp
Boiling point:	129° C at 18 mm Hg
Vapor pressure:	0.02 mm Hg at 20° C
Half-life (clean air) (poll. air = 1/10)	3.3 hours

### TOXICOLOGICAL PROPERTIES:

Probable route of human exposure by inhalation, or in industrial settings, through dermal contact. Contact with liquid will cause damage to the eyes, and burning and redness of the skin. Exposure to vapors irritates the eyes, nose, throat. Higher levels can cause coughing, tightness of the chest, and fluid in the lung, along with lightheadedness and unconsciousness. Repeated exposure can cause asthma and damage to the lungs, along with neurological disorders. Toluene-2,6-diisocyanate is not a definitive human carcinogen, but since it usually exists as a mixture with toluene-2,4-diisocyanate (a probable human carcinogen) it should be treated as such.

NIOSH REL... TWA 0.0005 ppm; CI 0.02 ppm/10 min.

### PRINCIPAL SOURCES:

Toluene-2,6-diisocyanate (TDI) is used in the production of polyurethane foam. Releases to the environment may occur during its commercial production, handling, and processing prior to its use in polyurethane foam production, and during the foam production process. Large quantities of TDI are transported by rail, road, and sea, presenting the possibility of accidental releases during transport, loading and unloading.

### ENVIRONMENTAL FATE:

TDI released onto land or into water rapidly hydrolyzes, producing a solidified mass or crust which binds the TDI, producing primarily polyureas. In the atmosphere, removal is due to reaction with photochemically produced hydroxyl radicals, and dry deposition.

## 1,1,1-TRICHLOROETHANE

Synonyms: Chloroethene, Methyl chloroform, Solvent-111,  $\alpha$ -T, 1,1,1-TCE

LA DEQ Regulatory Classification: Class 2

CAS Registry Number: 71556

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### PHYSICAL PROPERTIES:

Physical state:	Colorless liquid
Odor:	n/a
Boiling point:	74.1° C
Vapor pressure:	100 mm Hg at 20° C
Half-life (clean air) (poll. air = 1/10)	2359.3 days

### TOXICOLOGICAL PROPERTIES:

Moderately toxic by ingestion, inhalation, and skin contact. Human systemic effects from ingestion or inhalation include hallucinations, motor activity changes, irritability, diarrhea, nausea or vomiting. Skin or eye contact can produce irritation, especially of the eye. This substance has a narcotic effect if taken in high concentrations, and can produce proarrhythmia of the heart, which can result in cardiac arrest.

EPA HEA Doc... Chronic  
ACGIH TLV..... 350 ppm; STEL 450 ppm  
OSHA PEL..... TWA 350 ppm

### PRINCIPAL SOURCES:

Used as a cleaning solvent, a chemical intermediate to produce vinylidene chloride, and a propellant in aerosol cans.

### ENVIRONMENTAL FATE:

Information not available.

### SELECTED REFERENCES:

# 1,1,2-TRICHLOROETHANE

Synonyms: Ethane trichloride, NCI-CO4579,  $\beta$ -Trichloroethane, Vinyl trichloride

LA DEQ Regulatory Classification: Class 2

CAS Registry Number: 79005

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## PHYSICAL PROPERTIES:

Physical state:	Colorless liquid
Odor:	Sweet-smelling
Boiling point:	113.85° C at 760mm Hg
Vapor pressure:	22.49 mm Hg at 25° C
Half-life (clean air)	49 days
(poll. air = 1/10)	
Water solubility	High (4,400 mg/L)

## TOXICOLOGICAL PROPERTIES:

Can be absorbed into the body through ingestion, inhalation, and dermal contact. Most likely route of exposure from breathing or skin contact. Skin contact is highly irritating and painful. Short-term exposure to high concentrations can cause liver or kidney damage, and can affect the nervous and immune systems, or cause death. Groups at highest risk of exposure to 1,1,2-trichloroethane are industrial workers and possibly hazardous waste landfill workers. A suspected carcinogen.

IARC Classification... 3  
EPA Classification.... C  
ACGIH TLV..... TWA 10 ppm (skin)  
OSHA PEL..... TWA 10 ppm (skin)

## PRINCIPAL SOURCES:

1,1,2-Trichloroethane is produced by only two companies in the U.S., where it is used as an intermediate in the manufacture of 1,1-dichloroethane. It is also used as a solvent and may be found in some consumer products (not specified). There is evidence that 1,1,2-trichloroethane may be found in hazardous waste landfills as the breakdown product of 1,1,2,2-tetrachloroethane. Data on the current production and use of 1,1,2-trichloroethane is completely inadequate. Detailed information of its uses is essential for estimating exposure to the population and to determine groups at high-risk of exposure.

## ENVIRONMENTAL FATE:

When 1,1,2-trichloroethane is released into the environment, it eventually ends up in the atmosphere or groundwater. Reaction in the air is slow (half-life 49 days) so it may disperse far from where it originated before degrading. In air,

# TRICHLOROETHYLENE

Synonyms: Acetylene trichloride, Dow-tri, Ethylene trichloride, NCI-CO4546,  
Perm-a-chlor, Trichloroethene, 1,2,2-Trichloroethylene

LA DEQ Regulatory Classification: Class 2

CAS Registry Number: 79016

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## PHYSICAL PROPERTIES:

Physical state:	Colorless liquid
Odor:	Characteristic chloroform
Boiling point:	86.7° C
Vapor pressure:	74 mm Hg at 25° C
Half-life (clean air) (poll. air = 1/10)	6.8 days

## TOXICOLOGICAL PROPERTIES:

Can enter body through inhalation, ingestion of contaminated water, or absorption through the skin. Symptoms of exposure through all of these routes include dizziness, headache, sleepiness, and facial numbness. Higher exposures can result in depressed central nervous system effects - unconsciousness and death. Prolonged or repeated exposure can result in damage to the liver, kidney, lung, male reproductive organs, and blood. Animal studies indicate that trichloroethylene is a carcinogen and produces undesirable reproductive effects such as sterility or damage to the fetus.

IARC Classification... 3  
EPA Classification..... B2  
ACGIH TLV..... TWA 50 ppm; STEL 200 ppm  
OSHA PEL..... TWA 100 ppm; CL 1200 ppm

## PRINCIPAL SOURCES:

Trichloroethylene is widely used as a solvent and metal degreaser. It is also an ingredient in adhesives, paints, spot removers, typewriter correction fluid, and paint removers. Trichloroethylene may be released into the environment from evaporation from these products, releases from manufacturing facilities, chemical plants, and municipal waste incinerators. As a result of its wide use and emission, trichloroethylene has become ubiquitous in the environment. Background levels of trichloroethylene have been found in urban and rural air, in many lakes and streams, and in groundwater. Various federal and state surveys indicate that between 9 and 34% of the water supply sources in the U.S. may be contaminated with it. Trichloroethylene has been found in at least 460 of the 1,179 hazardous waste sites on the National Priorities List.

# VINYL ACETATE

Synonyms: Acetic acid vinyl ester, VAC, 1-Acetoxyethylene, Ethenyl Acetate

LA DEQ Regulatory Classification: Class 3

CAS Registry Number: 108054

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## PHYSICAL PROPERTIES:

Physical state:	Colorless liquid
Odor:	Sharp, sweet odor
Boiling point:	73° C
Vapor pressure:	83 mm Hg at 20° C
Half-life (clean air) (poll. air = 1/10)	12 hours

## TOXICOLOGICAL PROPERTIES:

Primary route of entry into the body is through inhalation. Contact with liquid can cause irritation and blistering of the skin and burns to the eyes. Inhalation can cause sore throat, cough, and irritation of the eyes and nose. Very high levels will cause you to feel dizzy and lightheaded. Long-term effects may include lung damage, drying and cracking of the skin, and effects on the heart, liver, and nervous system. There is limited evidence that vinyl acetate causes thyroid and uterine cancer in laboratory animals.

ACGIH TLV..... TWA 10 ppm; STEL 20 ppm

## PRINCIPAL SOURCES:

Vinyl acetate is extensively used in the production of polyvinyl resins. Releases to the environment are primarily from industrial sources. It is also present in trace amounts in the emissions from waste incinerators.

## ENVIRONMENTAL FATE:

The primary fate of vinyl acetate in water and soils is hydrolysis (est. half-life 7.3 days), with biodegradation a significant process as well. In dry soils, volatilization is likely to occur. In the atmosphere, vinyl acetate is expected to exist in the vapor phase, where it is rapidly degraded by the reaction with photochemically generated hydroxyl radicals.

## SELECTED REFERENCES:

2, 3, 5, 7

# VINYL CHLORIDE

Synonyms: Chloroethene, Chloroethylene, VC, VCM, Ethylene monochloride

LA DEQ Regulatory Classification: Class 1

CAS Registry Number: 75014

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## PHYSICAL PROPERTIES:

Physical state:	Colorless gas
Odor:	Mild, sweet
Boiling point:	-153.8° C at 760mm Hg
Vapor pressure:	2,660 mm Hg at 25° C
Half-life (clean air) (poll. air = 1/10)	4.3 days

## TOXICOLOGICAL PROPERTIES:

Can be absorbed into the body through ingestion, inhalation, and dermal contact. Vinyl chloride in groundwater results from industrial water effluents and soil contamination. Most of the vinyl chloride entering the environment eventually enters the air, yet the levels measured in outdoor air are usually three orders of magnitude lower than occupational settings. Currently, FDA limits the amount of vinyl chloride allowed in food packaging to limit its ingestion. Short-term exposures to very high levels in air can cause dizziness, lack of muscle coordination, headaches, unconsciousness, and death. Long-term exposure to lower unmeasured amounts by workers at vinyl chloride plants has resulted in severe liver damage, lung damage, bone abnormalities, thickening of the dermis, and blood disorders. Vinyl chloride is also a known carcinogen.

IARC Classification...1  
EPA Classification..... A  
ATSDR..... Repro, Devel, Chron, Acute  
ACGIH TLV..... TWA 5 ppm; Human Carcinogen  
OSHA PEL..... TWA 1 ppm; CL 5 ppm

## PRINCIPAL SOURCES:

Vinyl chloride is produced at 11 locations in the U.S., 6 of which are located in Louisiana. Domestic production of vinyl chloride during 1986 was 8.439 billion lbs. Virtually all vinyl chloride produced is used in the production of polyvinyl chloride plastics, which are used in a multitude of industrial and consumer products.

# VINYLDENE CHLORIDE

Synonyms: 1,1-Dichloroethene, 1,1-Dichloroethylene

LA DEQ Regulatory Classification: Class 2

CAS Registry Number: 75354

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## PHYSICAL PROPERTIES:

Physical state:	Colorless liquid
Odor:	Mild, sweet
Boiling point:	31.7° C
Vapor pressure:	591 mm Hg at 25° C
Half-life (clean air)	11 hours
(poll. air = 1/10)	

## TOXICOLOGICAL PROPERTIES:

Primary human exposure route through inhalation or absorption through the skin. Contact with liquid can irritate and burn the eyes or skin. Vapors can irritate the eyes, nose, and throat. Continued or higher exposure levels produce intoxication and unconsciousness. Repeated exposure may cause liver and kidney damage, bronchitis, and lung function loss. Animal studies indicate that vinylidene chloride is a carcinogen and causes undesirable reproductive effects such as sterility in males or damage to the developing fetus.

IARC Classification... 3  
EPA Classification..... C  
EPA HEA Doc..... Devel., Repro., Acute, Chronic  
ACGIH TLV..... TWA 5 ppm; STEL 20 ppm

## PRINCIPAL SOURCES:

Vinylidene chloride is used in the manufacture of plastic wrap, adhesives, and synthetic fiber. Vinylidene chloride is formed by a minor pathway during the anaerobic biodegradation of trichloroethylene and also by the hydrolysis of 1,1,1-trichloroethane. Therefore, there is potential for it to form in ground water that has been contaminated by chlorinated solvents.

## ENVIRONMENTAL FATE:

When spilled on land or released into water, vinylidene chloride will primarily be lost by evaporation into the atmosphere. The remainder is subject to very slow hydrolysis and biodegradation. In the atmosphere, vinylidene chloride is very photochemically active; it will degrade by reaction with hydroxyl radicals with a half-life of 11 hours or less.

## O-XYLENE

Synonyms: o-Dimethylbenzene, 1,2-Dimethylbenzene, o-Methyltoluene,  
1,2-xylene, o-Xylol

LA DEQ Regulatory Classification: Class 2

CAS Registry Number: 95476

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### PHYSICAL PROPERTIES:

Physical state:	Clear liquid
Odor:	Strong, sweet
Boiling point:	144.4° C
Vapor pressure:	5 mm Hg at 25° C
Half-life (clean air)	1.9 days
(poll. air = 1/10)	

### TOXICOLOGICAL PROPERTIES:

Most likely exposure would be from inhalation or dermal contact. Exposure can irritate the eyes, nose and throat. It can also cause headaches, nausea and vomiting, tiredness and stomach upset. High levels can cause you to feel dizzy and lightheaded, and to pass out. Very high levels can cause death. Repeated exposure can damage the bone marrow, causing a low blood count. Xylenes can damage the liver and kidney, and prolonged contact can cause drying and cracking of the skin. Repeated exposure can cause poor memory, low concentration and other brain effects.

HEEP Listing..... Devel., Chronic, Aquatic  
ACGIH TLV..... TWA 100 ppm; STEL 150 ppm  
OSHA PEL..... TWA 100 ppm

### PRINCIPAL SOURCES:

O-xylene is a product of petroleum and coal tar distillation. It is used in the manufacture of phthalic acid and anhydride, the manufacture of terephthalic acid for polyester, for solvent recovery, in specialty chemical manufacture, in aviation gasoline, in the manufacture of dyes, insecticides, and pharmaceuticals, and in a variety of lacquers, coatings, and cements.

### ENVIRONMENTAL FATE:

Xylene released onto land or into the water would primarily volatilize into the atmosphere. Remaining xylenes would biodegrade depending on microorganisms present, moisture, and aeration. In the atmosphere, removal of xylenes is primarily through reaction with photochemically generated hydroxyl radicals.



## **XYLENES**

( m- & p- xylenes)

Synonyms: Dimethylbenzene, Methyl toluene, NCI-C55232, Xylol, Violet 3

LA DEQ Regulatory Classification: Class 2

CAS Registry Number: 1330207 - mixed isomers

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### **PHYSICAL PROPERTIES:**

Physical state:	Clear liquid
Odor:	Strong, sweet
Boiling point:	138.5° C
Vapor pressure:	6.72 Hg at 25° C
Half-life (clean air) ( poll. air = 1/10)	1.9 days

### **TOXICOLOGICAL PROPERTIES:**

Most likely exposure would be from inhalation or dermal contact. Exposure can irritate the eyes, nose and throat. It can also cause headaches, nausea and vomiting, tiredness and stomach upset. High levels can cause you to feel dizzy and lightheaded, and to pass out. Very high levels can cause death. Repeated exposure can damage bone marrow, causing low blood count. Xylenes can damage the liver and kidney, and prolonged contact can cause drying and cracking of the skin. Repeated exposure can cause poor memory, concentration difficulty and other brain effects.

HEEP Listing... Devel., Chronic  
ACGIH TLV..... TWA 100 ppm; STEL 150 ppm  
OSHA PEL..... TWA 100 ppm

### **PRINCIPAL SOURCES:**

Xylenes are widely used as solvents and in the making of drugs, dyes, insecticides, and gasoline. Xylenes are also used as a solvent for paraffins in medical histology labs.

### **ENVIRONMENTAL FATE:**

Xylene released onto land or into the water would primarily volatilize into the atmosphere. Remaining xylenes would biodegrade depending on microorganisms present, moisture, and aeration. In the atmosphere, removal of xylenes is primarily through reaction with photochemically generated hydroxyl radicals.

## **ZINC**

(fume or dust)

Synonyms: Blue powder, C.I. Pigment metal 6, Granular zinc, Merrillite, Zinc dust,  
Zinc - powder or dust , Zinc - powder or dust  
(pyrophoric) (non-pyrophoric)

LA DEQ Regulatory Classification: Class 2

CAS Registry Number: 7440666

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### **PHYSICAL PROPERTIES:**

Physical state:	Bluish-white, lustrous metal
Odor:	n/a
Melting point:	419.5° C
Vapor pressure:	n/a
Half-life (clean air) (poll. air = 1/10)	n/a

### **TOXICOLOGICAL PROPERTIES:**

Refined zinc is a metal with many uses in industry. It is found naturally in the air, soil, water, and foods. It is an essential nutrient required by the body in low doses; however, zinc can also be harmful to health when too much is consumed. Higher levels of exposure to zinc can occur from drinking water or other liquids stored in galvanized metal containers, from drinking water that is contaminated by waste zinc from industrial sources or toxic waste sites, and from the air at galvanizing, smelting, welding or brass foundry operations at the workplace. If taken in large doses by mouth even for a short period of time, stomach and digestion problems can occur. Chronic exposure can result in intestinal problems derived from interference with absorption of nutrients and elements in food, particularly other essential metals such as copper and iron. When zinc is inhaled in the form of dust and fumes, a specific short lasting disease or syndrome called "fume fever" can result. This malady has symptoms similar to the flu.

EPA HEA Doc.... Devel., Repro., Chronic

### **PRINCIPAL SOURCES:**

Zinc is an element commonly found in the earth's crust, and natural releases to waterways can be significant. In addition, zinc is one of the most widely used metals in the world. The major industrial sources of zinc include electroplating, smelting and ore processing, and drainage from both active and inactive mining operations. Zinc is released to the atmosphere as dust and fumes from zinc production facilities, lead smelters, brass works, automobile emissions, incineration, and soil erosion. These sources, along with releases of zinc from metal erosion and tire wear contribute to urban runoff contamination.

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